

Technology Benefit Estimator (T/BEST)

USER'S MANUAL

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WELCOME TO T/BEST

This is the documentation on the T/BEST (Technology Benefit ESTimator) Users and Programmers Manual. T/BEST which is operational on IRIS SGI workstation is a computer software developed at NASA Lewis Research Center for the benefit analysis of aerospace propulsion systems.

In T/BEST, the following capabilities are integrated:

- engine cycle analysis, engine sizing and weight estimation
- fan, compressor, and turbine blade structural analyses
- transonic fluid flow solution and efficiencies for each rotor
- noise estimation
- range estimation
- aircraft weight analysis
- city pairs determination
- direct operating cost
- aircraft repair requirements cost
- engine maintenance cost
- mission performance

SUMMARY

The Technology Benefit Estimator (T/BEST) system is a formal method to assess advanced technologies and quantify the benefit contributions for prioritization. T/BEST may be used to provide guidelines to identify and prioritize high payoff research areas, help manage research and limited resources, show the link between advanced concepts and the bottom line, i.e., accrued benefit and value, and to credibly communicate the benefits of research.

The T/BEST software computer program is specifically designed for estimating benefits, and benefit sensitivities, of introducing new technologies into existing propulsion systems. Key engine cycle, structural, fluid, mission and cost analysis modules are used to provide a framework for interfacing with advanced technologies. An open-ended, modular approach is used to allow for modification and addition of both key and advanced technology modules. T/BEST has a hierarchical framework that yields varying levels of benefit estimation accuracy that are dependent on the degree of input detail available. This hierarchical feature permits rapid estimation of technology benefits even when the technology is at the conceptual stage. As knowledge of the technology details increases the accuracy of the benefit analysis increases.

Included in T/BEST's framework are correlations developed from a statistical data base that is relied upon if there is insufficient information given in a particular area, e.g., fuel capacity or aircraft landing weight. Statistical predictions are not required if these data are specified in the mission requirements. The engine cycle, structural, fluid, cost, noise, and emissions analyses interact with the default or user material and component libraries to yield estimates of specific global benefits: range, speed, thrust, capacity, component life, noise, emissions, specific fuel consumption, component and engine weights, pre-certification test, mission performance engine cost, direct operating cost, life cycle cost, manufacturing cost, development cost, risk, and development time.

Currently, T/BEST operates on stand-alone or networked workstations, and uses a UNIX shell or script to control the operation of interfaced FORTRAN based analyses. T/BEST's interface structure works equally well with non-FORTRAN or mixed software analyses. This interface structure is designed to maintain the integrity of the expert's analyses by interfacing with expert's existing input and output files. Parameter input and output data (e.g., number of blades, hub diameters, etc.) are passed via T/BEST's neutral file, while copious data (e.g., finite element models, profiles, etc.) are passed via file pointers that point to the experts' analyses output files. In order to make the communications between the T/BEST's neutral file and attached analyses codes simple, only two software

commands, PUT and GET, are required. This simplicity permits easy access to all input and output variables contained within the neutral file. Both public domain and proprietary analyses codes may be attached with a minimal amount of effort, while maintaining full data and analysis integrity, and security.

T/BEST's software framework, status, beginner-to-expert operation, interface architecture, analysis module addition, key analysis modules are discussed. Representative examples of T/BEST benefit analyses are shown.

SECTION 1.0

INTRODUCTION

1.1 Learning About T/BEST

Improvements in technology have contributed to the advancement of research in the area of aerospace propulsion systems. To efficiently take advantage of these advances, the need arises to communicate the benefits of advanced technology in this research area. As a result, an effort was undertaken at NASA Lewis Research Center to develop a computational simulation, T/BEST (Technology Benefit ESTimator), that successfully integrates several disciplines in the area of aerospace propulsion systems to yield the benefits in emissions, noise, weights, thrust, range, specific fuel consumption, cost, etc.

T/BEST is an executive system developed for the benefit analysis of aerospace propulsion systems. Figure 1.1 depicts the default computational simulation modules of T/BEST. The executive system controls the execution of all modules as well as the flow of information between modules. A computational module is defined here as a FORTRAN (other languages may be included) program with a specified analysis capability. All modules inter-communicate via a data bank system named *neutral.file*.

The first and last analysis modules executed in T/BEST are, respectively, NNEPWATE [Ref. 1] and FLOPS [Ref. 11]. Each module requires prior to execution the availability of its standard input file(s). These files are generated using built-in pre-processor in T/BEST with the exception of NNEPWATE where these files are to be provided by the user. NNEPWATE sample input files will be available in the first release of T/BEST.

The disciplines integrated in T/BEST are:

1. thermodynamics
2. structures
3. fluid flow
4. cost
5. mission
6. emissions
7. noise

The T/BEST executive system conforms with three levels of user's expertise:

1. beginner, a first time user, is advised to execute T/BEST using the sample example included in the first release (section 3.2).

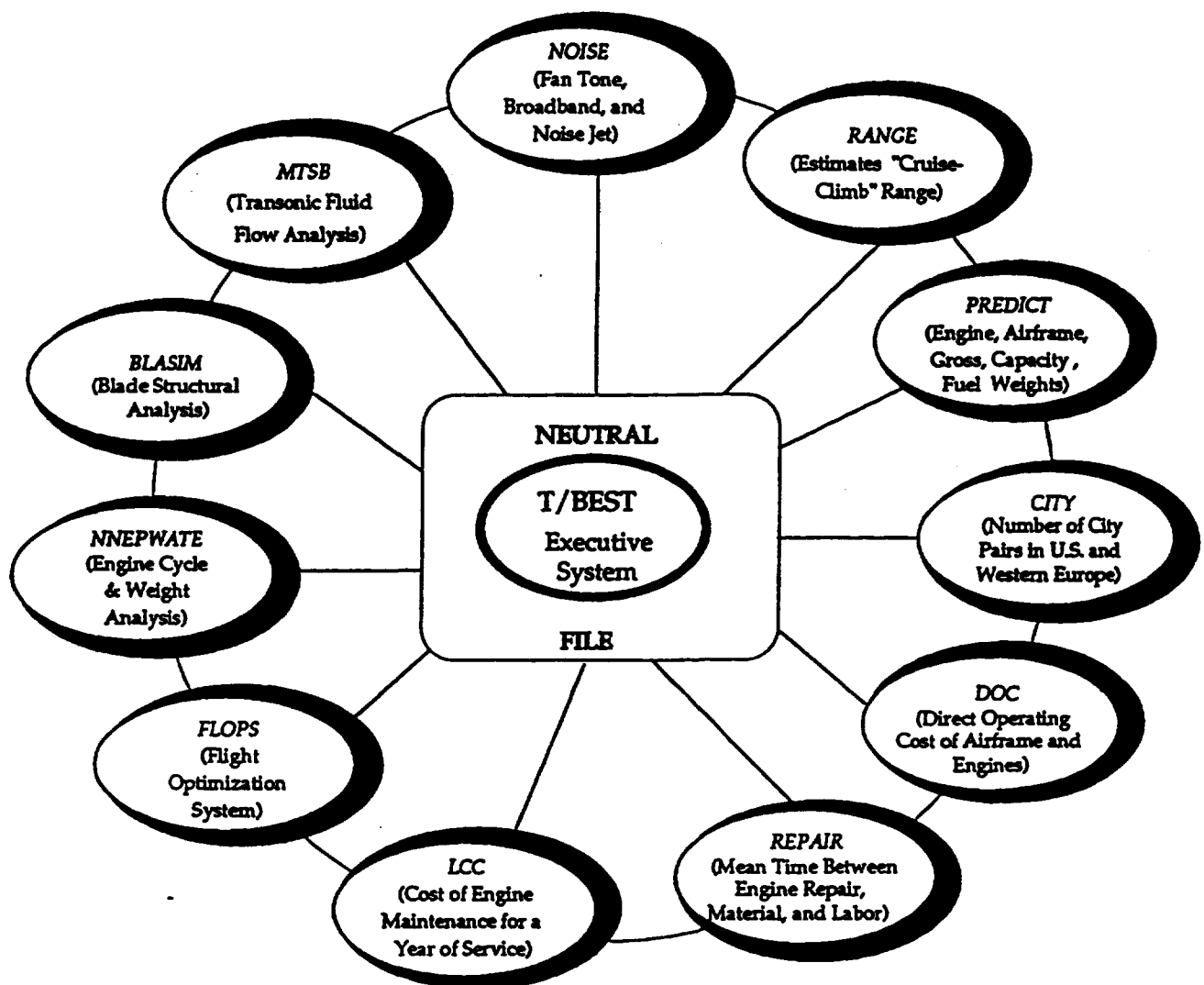


Figure 1.1 Default Computational Simulation Modules of the T/BEST Executive System

2. intermediate, a user that has executed T/BEST several times, must be able to modify many neutral file default parameters (section 3.3).
3. expert, a user with extensive experience in executing T/BEST, must be able to modify all neutral file default parameters. Also, an expert can add or remove modules to or from T/BEST.

1.2 How to Use This Manual

The primary objective of this User's Manual is to provide information and practices for learning the T/BEST system. This manual is divided into seven sections and four appendices.

The introduction is found in the first section followed by setting-up T/BEST in section 2. One example is included in this manual in section 3 while section 4 provides a complete description of the T/BEST executive system. The T/BEST analyses modules are discussed in section 5 followed by parametric studies in section 6. The references for all modules in T/BEST are listed in section 7.

Appendix A describes the example for a supersonic mission in addition to complete listing of the NNEPWATE engine input and map files, and the T/BEST neutral file. The content and format of the airfoil data bank used to generate the geometry of the fan, compressor, and turbine blades is discussed in appendix B. The blade geometry is used by both BLASIM [Ref. 3] and MTSB [Ref. 4] modules.

Appendix C lists the neutral file input parameters given to and/or obtained from a module. A complete listing of the UNIX shell script used to execute T/BEST is available in appendix D as well as listing of the names of executables of all modules in T/BEST. Also, appendix D contains a listing of the material data bank that is needed to provide the BLASIM module with material properties to conduct structural analysis of fan, compressor and turbine blades.

SECTION 2.0

SETTING UP T/BEST

2.1 Preparing to Use T/BEST

The effort required to prepare to use T/BEST is discussed here. Before executing T/BEST, the user must prepare the two input files required to run the NNEPWATE [Ref. 1] module. The first file which must have the extension ".input" contains information pertaining to components types and their configurations to form a specific engine. The second file with the extension ".maps" contains all performance map tables used to model off design performance of engine components. The NNEPWATE input files must be placed in the user's T/BEST input sub-directory. Typical input and map files are listed in appendix A.

The T/BEST directory tree, described in details in the following section, is shown in Figure 2.1.

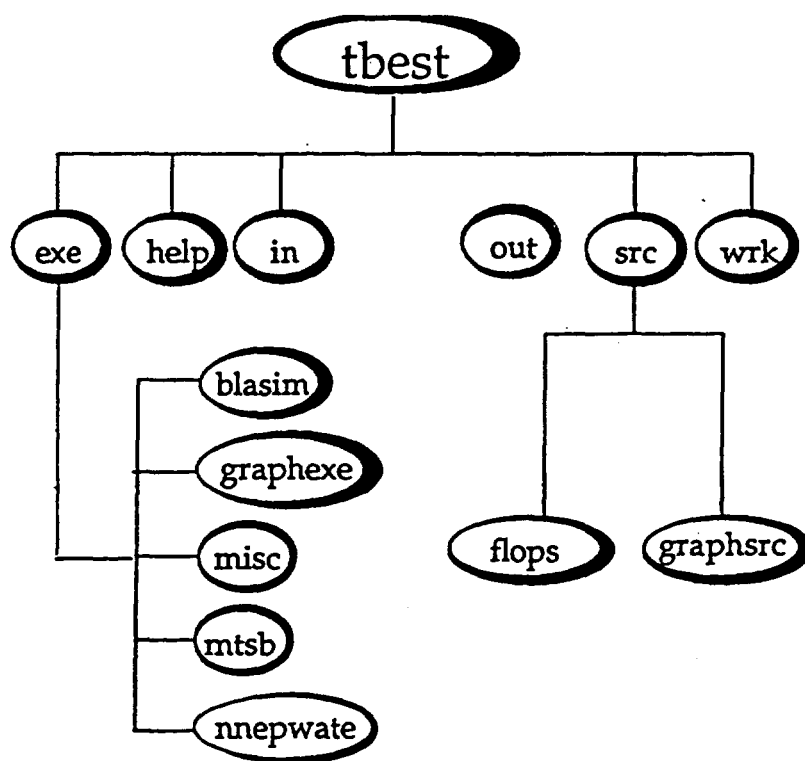


Figure 2.1 T/BEST Directory Tree

2.2 Restoring T/BEST *tar* file and Directories

The installation of T/BEST on a workstation is made easy by utilizing the UNIX *tar* command which saves and restores files on a magnetic tape. All the T/BEST system is stored in a single file named *tbest.tar*. A single command is required to load *tbest.tar* off a tape and restore all the T/BEST files: *tar xvf /dev/tape tbest.tar*.

The T/BEST system is structured to provide the user with excellent book-keeping facilities. Input and output files, source codes, and executables of all modules are stored in pre-assigned sub-directories. The mother directory is named *tbest* and at that level the execution of T/BEST is activated. The shell script that controls the execution of T/BEST is located here under the name *tbest.exe*. The sub-directories that are branched out of *tbest* are listed below:

/tbest/exe

Several sub-directories containing executable for various modules ramify from here:

/tbest/exe/blasim

Contains executable of the BLASIM module: *blasim.exe*.

/tbest/exe/mtsb

Contains executable of the MTSB module: *mtsb.exe*.

/tbest/exe/misc

Contains the following executables: *blasimgen.exe*, *blasimpost.exe*, *blasimsr.exe*, *mtsbgen.exe*, *mtsbpost.exe*, *noise.exe*, *range.exe*, *predict.exe*, *city.exe*, *doc.exe*, *repair.exe*, *lcc.exe*, *flopsgen.exe*, and *flopspost.exe*.

/tbest/exe/nnepwate

Contains executable of the NNEPWATE module: *nnepwate.exe*.

/tbest/exe/flops

Contains executable of the FLOPS module: *flops.exe*.

/tbest/exe/graphexe

Contains executable of the graphic modules: *pchart.exe* and *bchart.exe* for pie chart and bar chart display of results.

/tbest/help

The T/BEST help utility is found here. It is a UNIX file named *help_tbest*. This capability can be executed to provide general help information while running the T/BEST executive system.

/tbest/in

All input files generated during the execution of T/BEST are stored here. This includes input files for BLASIM, MTSB, NNEPWATE, and FLOPS modules as well as the neutral file which is updated following the execution of each module.

/tbest/out

Output files for BLASIM, MTSB, NNEPWATE, and FLOPS modules are stored here.

/tbest/src

Contains source codes for all analyses modules and their pre-and-post processors. The analyses modules residing here are: NNEPWATE, BLASIM, MTSB, NOISE, RANGE, PREDICT, CITY, DOC, REPAIR, and LCC. The pre-and-post-processors modules are: BLASIMGEN, BLASIMPOST, BLASIMSR, MTSBGEN, MTSBPOST, FLOPSGEN, and FLOPSPOST. Complete description of all analyses modules is given in section 5.

A sub-directory is branched out at this level:

/tbest/src/flops

Contains FLOPS FORTRAN source code. The FLOPS module consists of the following programs: sfareo.f, sfcost.f, sfcycl.f, sfeng.f, sffoot.f, sfmain.f, sfperf.in, sftol.f, sfwate.f, smacyc.f, and smatol.f.

Another sub-directory is branched out at this level:

/tbest/src/graphsrc

Contains FORTRAN and C source codes for bar and pie charts graphic modules: BCHART, BARCHART, PCHART, and PIECHART. These modules display graphically cost and repair results obtained from the T/BEST neutral file. Refer to section 4 for further details.

/tbest/wrk

This is the working sub-directory of the T/BEST executive system. All scratch and non essential files are stored here. These files could be accessed by the user for further processing.

When the execution of T/BEST is completed, the NNEPWATE, BLASIM, MTSB and FLOPS input and output files are stored in */user/tbest/out* and */user/tbest/in* sub-directories. The updated neutral file is stored in */user/tbest/in* sub-directory. The example given in section 3 will walk the user through the steps of setting-up and executing T/BEST.

SECTION 3.0

DEMONSTRATION OF T/BEST

3.1 Executing T/BEST

Once the T/BEST tar file has been loaded on an SGI workstation and all sub-directories have been restored as indicated in Section 2, a first-time user of the system is advised to execute T/BEST using one of the already existing examples. A simple command is required to start the execution of T/BEST:

```
/usr/userid/tbest:  tbest.exe
```

The tbest.exe file is a UNIX shell script which controls the execution of T/BEST. Refer to section 4 for a complete description of the T/BEST executive system. Prior to running T/BEST, the engine input and map files used by the NNEPWATE module for engine cycle analysis and weight approximation must be placed in the T/BEST input sub-directory. An array of engine examples, supersonic and subsonic missions, already have been embedded into the input sub-directory to facilitate the use T/BEST, especially for first-time users.

In this section, T/BEST is executed for a sample example pertaining to a supersonic engine operating under constant design thrust. A complete description of the example is available in section A.1 of appendix A. The steps required to construct the fan, compressor and turbine blades are discussed in section A.2. Listings of the engine input and map files are available in sections A.3 and A.4. The neutral file obtained at the end of the execution of T/BEST is listed in its entirety in section A.5.

In this example, a special feature of BLASIM, ice impact on fan blades, is demonstrated. It is assumed that a piece of ice having a radius of 0.8" and traveling at a speed of 150 knots impacts the first stage fan blade. The foreign object damage analysis capability is carried out at any stage once VELFOD is larger than zero. The input parameters are listed below:

1. VELFOD (foreign object velocity, knots)
2. DENFOD (foreign object density, lb.sec²/in⁴)
3. RADFOD (foreign object spherical radius, in.)

Many parameters used in the neutral file are initially defined by default. For example, some of these parameters are aircraft gross weight, fuel and engine oil cost, etc.. Section 4.2 discusses in details the content and structure of the neutral file. Appendix C lists the neutral file parameters going into a module and coming out of a module.

3.2 Interactive Session for the Supersonic Engine Example

The interactive sessions seen on a computer screen while running T/BEST using the supersonic engine are shown in this section. The execution of T/BEST is automatic and requires very minimum user's interaction. Note that each screen is separated by two lines. Each input or response to questions shown is highlighted in bold letters. Description and listing of input and output of this example is found in appendix A.

```
TTTTTTTTTTTT // BBBB BBBB EEEEEEEEEEE SSSSSSSSSS TTTTTTTTTTTT
TTTTTTTTTTTT // BBBB BBBB EEEEEEEEEEE SSSSSSSSSSSS TTTTTTTTTTTT
TT // BB BB EE SS SS TT
TT // BB BB EE SS TT
TT // BB BB EE SSS TT
TT // BBBB BBBB EEEEEEE SSSSSSSS TT
TT // BBBB BBBB EEEEEEE SSSSSSSS TT
TT // BB BB EE SSS TT
TT // BB BB EE SS TT
TT // BB BB EE SS TT
TT // BBBB BBBB EEEEEEEEEEE SSSSSSSSSS TT
TT // BBBB BBBB EEEEEEEEEEE SSSSSSSSSS TT
```

Technology Benefit ESTimator

user's id
user's name

DATE xxxx
TIME xxxx

Press <return> to continue . . . or press h for help . . . <CR>

Executing neutgen
Generating neutral file for T/BEST

INPUT: neutral.file default parameters
OUTPUT: /usr/lerc/smabmri/tbest/in/neutral.file

Press <return> to continue . . . <CR>

***** WELCOME TO T/BEST *****

The T/BEST executive system utilizes a data bank named neutral.file to exchange information among all modules. Prior to the execution of T/BEST, you may update or modify any of the defaulted parameters in neutral.file. For a complete description of neutral.file, please refer to the T/BEST User's Manual.

Do you wish to update any of the defaulted parameters?
(Enter Yes or No):y

In T/BEST, the user's level of expertise is classified as:

- 1) BEGINNER
- 2) INTERMEDIATE
- 3) EXPERT

Select your level of expertise by entering

the corresponding level number: 3

For an expert user, any parameter in the neutral.file may be updated. At this level of expertise, the list of parameters will not be displayed on screen. For information on the content and structure of the neutral.file, please refer to the T/BEST User's Manual.

Hit Return to Continue<CR>

Enter the parameter keyword as listed in the T/BEST neutral.file: VELFOD

Please indicate whether the selected keyword belongs to a specific engine component data set.
(Enter Yes or No):y

Please indicate whether the selected keyword belongs to a specific stage of an engine component data set.
(Enter Yes or No):y

Please enter the engine component number: 2

Please enter the stage number: 1

Enter the new value of VELFOD : 150.0

Do you wish to update more parameters?
(Enter Yes or No): y

Enter the parameter keyword as listed in the T/BEST neutral.file: DENFOD

Please indicate whether the selected keyword belongs to a specific engine component data set.
(Enter Yes or No):y

Please indicate whether the selected keyword belongs to a specific stage of an engine component data set.
(Enter Yes or No):y

Please enter the engine component number: 2

Please enter the stage number: 1

Enter the new value of DENFOD : 0.9E-04

Do you wish to update more parameters?
(Enter Yes or No): y

Enter the parameter keyword as listed in the T/BEST neutral.file: RADFOD

Please indicate whether the selected keyword belongs to a specific engine component data set.
(Enter Yes or No):y

Please indicate whether the selected keyword belongs to a specific stage of an engine component data set.
(Enter Yes or No):y

Please enter the engine component number: 2

Please enter the stage number: 1

Enter the new value of RADFOD : 0.80

Do you wish to update more parameters?
(Enter Yes or No): n

T/BEST has chosen supersonic as its input
Would you like to use a different input file ? (Y/N) n

Executing nnepwate
Engine cycle and weight analyses

INPUT: /usr/lerc/smabmri/tbest/in/hsr_cdt.input
OUTPUT: /usr/lerc/smabmri/tbest/out/hsr_cdt.output

Executing nneppost
Post-Processing nnepwate output

INPUT: /usr/lerc/smabmri/tbest/out/hsr_cdt.output
OUTPUT: /usr/lerc/smabmri/tbest/in/neutral.file

Press <return> to continue . . . <CR>

Executing blasimgen
Generating blasim input files for all stages
of each fan, compressor, and turbine

INPUT: neutral.file
OUTPUT: blasim input files

Press <return> to continue . . . <CR>

BLASIM is processing BFAN0201.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BFAN0201.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BFAN0201.OUT

BLASIM is processing BFAN0202.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BFAN0202.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BFAN0202.OUT

BLASIM is processing BHPC0501.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BHPC0501.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BHPC0501.OUT

BLASIM is processing BHPC0502.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BHPC0502.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BHPC0502.OUT

BLASIM is processing BHPC0503.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BHPC0503.INP

OUTPUT: /usr/lerc/smabmri/tbest/out/BHPC0503.OUT

BLASIM is processing BHPC0504.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BHPC0504.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BHPC0504.OUT

BLASIM is processing BHPC0505.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BHPC0505.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BHPC0505.OUT

BLASIM is processing BHPT0801.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BHPT0801.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BHPT0801.OUT

BLASIM is processing BLPT0901.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BLPT0901.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BLPT0901.OUT

BLASIM is processing BLPT0902.INP
Blade structural analysis

INPUT: /usr/lerc/smabmri/tbest/in/BLPT0902.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/BLPT0902.OUT

Executing blasimpost
Update neutral file to include structural response parameters

INPUT: blasim output files
OUTPUT: neutral.file

Press <return> to continue . . .<CR>

Executing mtabgen
Generating mtsb input files for all stages
of each fan, compressor, and turbine

INPUT: neutral.file
OUTPUT: mtsb input files

Press <return> to continue . . .<CR>

MTSB is processing MFAN0201.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MFAN0201.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MFAN0201.OUT

MTSB is processing MFAN0202.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MFAN0202.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MFAN0202.OUT

MTSB is processing MHPC0501.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MHPC0501.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MHPC0501.OUT

MTSB is processing MHPC0502.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MHPC0502.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MHPC0502.OUT

MTSB is processing MHPC0503.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MHPC0503.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MHPC0503.OUT

MTSB is processing MHPC0504.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MHPC0504.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MHPC0504.OUT

MTSB is processing MHPC0505.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MHPC0505.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MHPC0505.OUT

MTSB is processing MHPT0801.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MHPT0801.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MHPT0801.OUT

MTSB is processing MLPT0901.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MLPT0901.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MLPT0901.OUT

MTSB is processing MLPT0902.INP
Transonic flow analysis

INPUT: /usr/lerc/smabmri/tbest/in/MLPT0902.INP
OUTPUT: /usr/lerc/smabmri/tbest/out/MLPT0902.OUT

Executing mtsbpost

Update neutral file to include output parameters form mtsb

INPUT: mtsb output files
OUTPUT: neutral.file

Press <return> to continue . . . <CR>

Executing noise

Estimates fan tone, broadband and noise jet
Update neutral file

INPUT: neutral.file
OUTPUT: updated neutral.file

Press <return> to continue . . . <CR>

Executing range

Estimates the BREGUET cruise-climb range
Update neutral file

INPUT: neutral.file
OUTPUT: updated neutral.file

Press <return> to continue . . . <CR>

Executing city

Determines number of city pairs in U.S. and Western Europe
Update neutral file

INPUT: neutral.file
OUTPUT: updated neutral.file

Press <return> to continue . . . <CR>

Executing repair

Estimates mean time between engine repair and material/labor
Update neutral file

INPUT: neutral.file
OUTPUT: updated neutral.file

Press <return> to continue . . . <CR>

Executing doc

Predicts direct operating cost of airframe and engines
Update neutral file

INPUT: neutral.file
OUTPUT: updated neutral.file

Press <return> to continue . . . <CR>

Executing lcc

Predicts engine maintenance cost for a given year of service
Update neutral file

INPUT: neutral.file
OUTPUT: updated neutral.file

Press <return> to continue . . . <CR>

Executing flopsgen

Generating flops input file

INPUT: neutral.file
OUTPUT: flopsin.file

Press <return> to continue . . . <CR>

Executing flops

Flight Optimization System (mission/cost analyses)

INPUT: flopsin.file
file renamed supersonic.flopsin
OUTPUT: flopsout.file
file renamed supersonic.flopsout

EXECUTING FLOPS RELEASE 5.4

Press <return> to continue . . . <CR>

Executing flopspost

Updating neutral file to include flops response parameters

INPUT: flopsout.file
OUTPUT: neutral.file

Press <return> to continue . . . <CR>

T/BEST neutral.file renamed supersonic.neutral
User's neutral file is located in
/usr/lerc/smabnri/tbest/in sub-directory

Press <return> to continue . . . <CR>

Execution of graphic codes to display results

Press <return> to continue . . .

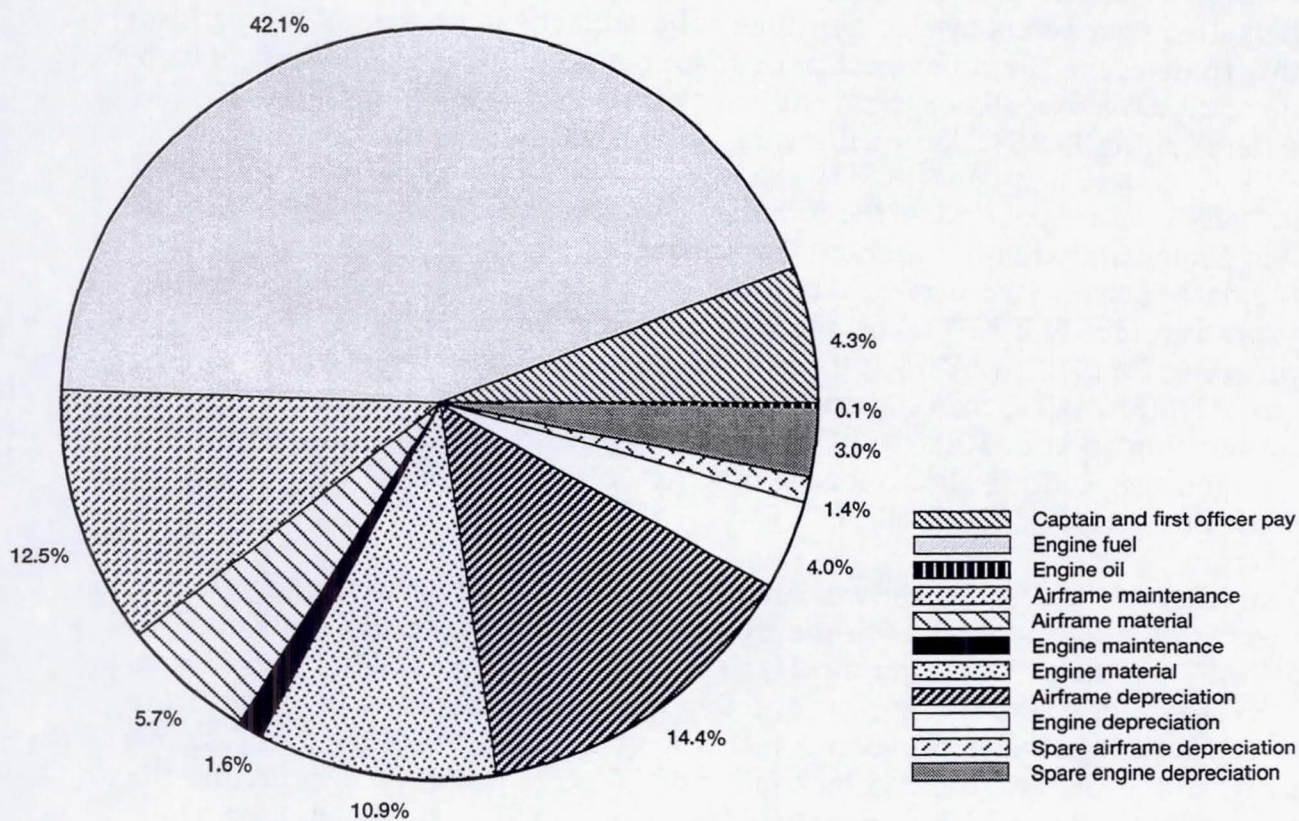


Figure 3.1.—Engine direct operating cost pie chart.

3.3 Changing Neutral File Default Parameters

In T/BEST, a user's level of expertise can be classified as beginner, intermediate or expert. A beginner user may modify the values of few parameters while an expert may modify the value of any parameter in the neutral file. More parameters may be changed by an intermediate user than with a beginner.

The neutral file default parameters are stored in *neutral.add* file. A complete listing of this file is given in section C.1 of appendix C. The user can update defaulted parameters by changing their values directly in *neutral.add*. To perform this change, the file must exist prior to executing T/BEST in */usr/tbest/in* sub-directory. The executive system will not overwrite a pre-existing *neutral.add* file. After running T/BEST for the first time, *neutral.add* is generated automatically.

A T/BEST user may update the defaulted parameters while executing T/BEST as it is demonstrated in this section. The interactive technique of updating neutral file data permits the user to modify the value of any parameter. The update procedure in T/BEST takes place while executing NNEPPOST, the post-processor for NNEPWATE. If the user decided to overwrite a parameter coming out of NNEPWATE, then the user must know the stage and component numbers in addition to the KEYWORD associated with the selected parameter. The interactive technique allows for the modification of *neutral.add* data as well as those post-processed by NNEPPOST.

The interactive session shown here are that of the same example problem discussed in section 3.2 with the exception that the capability embedded in T/BEST that allows a user to modify neutral file default parameters is exercised. Here, the expert user changes the airfoil type and material property for the blade of the fan (stage 1 of component 2). Also, the default values of the fuel cost and jet oil in the US. are updated by a factor of 2.0. Note that only a portion of the interactive session which demonstrate the update capability is shown here.

***** WELCOME TO T/BEST *****

The T/BEST executive system utilizes a data bank named *neutral.file* to exchange information among all modules. Prior to the execution of T/BEST, you may update or modify any of the defaulted parameters in *neutral.file*. For a complete description of *neutral.file*, please refer to the T/BEST User's Manual.

Do you wish to update any of the defaulted parameters?

(Enter Yes or No):y

In T/BEST, the user's level of expertise is classified as:

- 1) BEGINNER
- 2) INTERMEDIATE
- 3) EXPERT

Select your level of expertise by entering
the corresponding level number: 3

For an expert user, any parameter in the neutral.file
may be updated. At this level of expertise, the list of
parameters will not be displayed on screen. For information
on the content and structure of the neutral.file, please
refer to the T/BEST User's Manual.

Hit Return to Continue

Enter the parameter keyword as listed in the T/BEST
neutral.file: AIRCODE

(for changing airfoil profile)

Please indicate whether the selected keyword belongs to
a specific engine component data set.
(Enter Yes or No):y

Please indicate whether the selected keyword belongs to
a specific stage of an engine component data set.
(Enter Yes or No):y

Please enter the engine component number: 2

Please enter the stage number: 1

Please select airfoil type form table below:

- 1) NACA 63A210 FAN
- 2) NACA 63A210 TUR
- 3) NACA 64-206 FAN
- 4) NACA 64-206 TUR
- 5) NACA 66-206 FAN
- 6) NACA 66-206 TUR

Enter airfoil type number:1

Do you wish to update more parameters?
(Enter Yes or No):y

Enter the parameter keyword as listed in the T/BEST
neutral.file: MATSLC

(for changing blade material)

Please indicate whether the selected keyword belongs to
a specific engine component data set.
(Enter Yes or No):y

Please indicate whether the selected keyword belongs to
a specific stage of an engine component data set.
(Enter Yes or No): y

Please enter the engine component number: 2

Please enter the stage number:1

Please select blade material from the table below:

- 1) ALUMINUM
- 2) BERYLLIUM
- 3) FECR SUPER ALLOY
- 4) STAINLESS STEEL
- 5) TITANIUM

Enter material number: 4

Do you wish to update more parameters?
(Enter Yes or No):y

Enter the parameter keyword as listed in the T/BEST
neutral.file: AFUELD

(for changing domestic fuel cost)

Please indicate whether the selected keyword belongs to
a specific engine component data set.
(Enter Yes or No):n

Please indicate whether the selected keyword belongs to
a specific altitude data set.
(Enter Yes or No):n

Enter the new value of AFUELD : 0.22

Do you wish to update more parameters?
(Enter Yes or No):y

Enter the parameter keyword as listed in the T/BEST
neutral.file: BOILTD

(for changing engine oil cost)

Please indicate whether the selected keyword belongs to
a specific engine component data set.
(Enter Yes or No):n

Please indicate whether the selected keyword belongs to
a specific altitude data set.
(Enter Yes or No):n

Enter the new value of BOILTD : 12.0

Do you wish to update more parameters?
(Enter Yes or No):n

T/BEST has chosen supersonic as its input
Would you like to use a different input file? (Y/N) n

SECTION 4.0

DESCRIPTION OF T/BEST EXECUTIVE SYSTEM

In this section, an overview of the T/BEST executive system and its capabilities as a computer software are presented.

4.1 T/BEST Modules Interaction

Twenty-one modules make up the T/BEST executive system. Inter-modular chart of T/BEST is shown in Figure 4.1. All modules in T/BEST are written in FORTRAN with the exception of the graphic modules BCHAR and PCHAR which are made of FORTRAN and C programs. The order of execution of these modules is clockwise beginning with NEUTGEN and ending with BCHAR

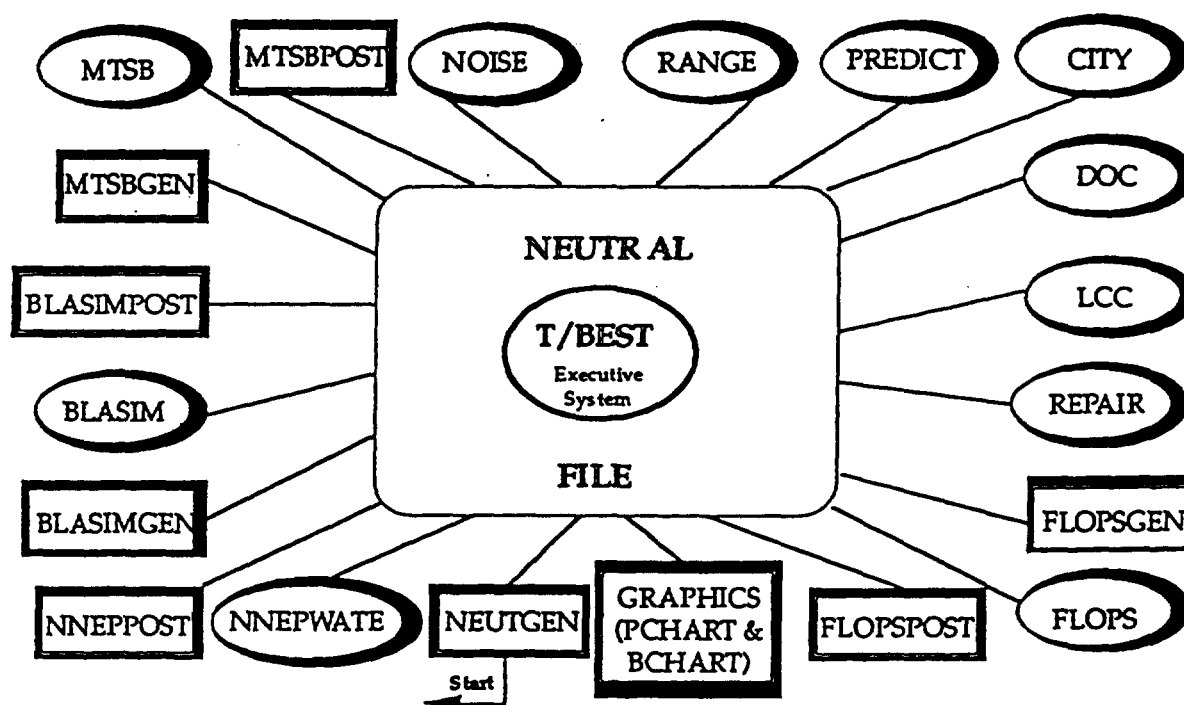


Figure 4.1 Inter-Modular Chart for the T/BEST Executive System

The execution of PREDICT is conditional to the following:

1. GW (aircraft gross weight) equals to zero
2. AW (airframe weight) equals to zero
3. FW (fuel weight) and FCR (fuel consumed at cruise) equal to zero

The RANGE module is executed if the RANGE parameter is zero in the neutral file. Note that the execution of the remaining modules is definite.

In this section, the interaction mode among all T/BEST modules is summarized. The information provided here guide an expert user to add, remove, or modify a T/BEST module if necessary. At the developmental stage of T/BEST, portability and modularity were determined to be a requirement.

NEUTGEN: This FORTRAN module is the first to be executed in T/BEST. It generates a file in /user/tbest/in sub-directory named *neutral.add* which is used to define the default values, for example, maintenance, repair and cost parameters. Also, at this stage a user has the opportunity to modify any parameter that is defaulted in the neutral file. Section C.1 of appendix C shows in details the data obtained and/or generated by this module and stored in the neutral file.

In T/BEST, the level of expertise of a user is classified as beginner, intermediate or expert. A beginner user can modify few selected defaulted parameters while an expert user may change the value of any defaulted parameter. An intermediate user may change more parameters than the one allowed for a beginner but less than that of an expert. All that is required is a knowledge of the parameter keyword. If any defaulted parameters are to be changed, NEUTGEN writes these data in a special file named *neutral.modify* located in the tbest input sub-directory. The procedure of changing the values of defaulted parameters has been demonstrated in the previous section.

NNEPWATE: This module is a combination of two FORTRAN computer codes: NNEP89 and WATE89. Two input files, *file.input* and *file.maps* are required to run the NNEPWATE module. It is required to place these files in the T/BEST input sub-directory. If more than one set of input and map files exist, the user must choose a specific set. The NNEPWATE output file stored in the T/BEST output sub-directory is used to provide the neutral file with information on the engine configuration. Section C.2 of appendix C shows in details the neutral file data obtained and/or generated by this module.

NNEPPOST: This FORTRAN module is used to post-process data from the NNEPWATE output file. Engine component and stage data are read from this file. When this module is executed, the neutral file is fully generated with assigned parameters describing engine configuration in addition to the defaulted data. Section C.3 of appendix C shows in details the neutral file data obtained and/or generated by this module.

The NNEPPOST module generates a mission data file, *nnepwate.missout*, named after the defaulted neutral file keyword EIFILE. This file contains thrust, fuel flow, and specific fuel consumption at various Mach number and altitude sets (off-design points). These data are required to run the FLOPS (FLight OPTimization System) module.

BLASIMGEN: This FORTRAN module generates the input file for BLASIM (blade structural analyzer). The input file naming procedure follows a specific criterion: *Btypiijj.INP* where

- *typ* is the component type such as FAN, HPT (high pressure turbine), LPT (low pressure turbine), HPC (high pressure compressor), and LPC (low pressure compressor).
- *ii* is the component number, for example component number 1 is represented by 01.
- *jj* is the stage number.

Section C.4 of appendix C shows in details the neutral file data obtained and/or generated by this module. The BLASIM input file is only generated for components that carry rotating stages (FAN, HPT, LPT, HPC, and LPC).

The blade for a rotating stage is defined using one of the two methods listed below:

AIRFOIL DEFINITION described via the neutral file keyword AIRCODE. By default, the blade profile is based on the airfoil type NACA 64-206 FAN for fan and compressors and NACA 64-206 TURBINE for turbines (see airfoil data bank in appendix B). The blade is constructed based on the following considerations:

- number of stations: 11
- number of coordinates per station (it is the same for all stations): 11
- one stagger angle used for all stations: 35 Degrees
- root thickness is defined as a percentage of the first chord: 6%
- chord length for the all stations is interpolated from the mean chord length. Note that the blade taper ratio, hub and tip radii are obtained from the NNEPWATE output.
- an expert user can modify all the above and vary the stagger angle for each station.

FULL BLADE DEFINITION described via the neutral file keyword ABLDEF. The airfoil data bank (appendix B) is capable of accepting full blade geometry in addition to the airfoil definition. The user must construct the blade based on parameters obtained from NNEPWATE. These parameters are: aspect ratio, and hub and tip radii. This input option requires a detailed airfoil at each station which includes: upper and lower coordinates, spanwise coordinates, blade radius, and stagger angle.

Appendix B describes in details along with several examples the format and data required to define an airfoil to construct a blade or to input a full blade geometry. Note that both airfoil and blade definitions use standard industry format.

BLASIM: This FORTRAN module is used for the structural analysis of the blade including foreign object damage (e.g. ice impact). BLASIM performs static, modal, fatigue, resonance margin, and flutter analyses of engine blades. Although it is capable of handling composite blades, for simplicity, the blade consists of a single material. The BLASIM module is executed automatically for those stages which input have been generated. Its input is read on logical unit 25. The defaulted analyses options performed by BLASIM for each stage are: static, modal, fatigue, and resonance margin. Foreign object damage (FOD) assessment is evaluated once the velocity (VELFOD), radius (RADFOD) and density (DENFOD), respectively, are updated to values other than zero. Note that BLASIM does not supply directly any data to the neutral file (section C.5).

Two input files are required to run BLASIM: the main input file contain analysis options and blade geometry, and a material data bank file listed in section D.4 of appendix D. The BLASIM input files are stored in the */user/tbest/in* sub-directory while the output files are stored in */user/tbest/out* sub-directory. The material and airfoil data banks, *databk.data* and *airfoil.bank*, must be stored in the */user/tbest* mother directory.

Each time BLASIM is executed an independent routine named BLASIMSR is run to process static stresses from BLASIM and compute the failure root stress function based on the modified distortion energy (MDE) criterion [Ref. 10]. This is the only routine in T/BEST with a minor function and not shown on the modular chart. BLASIMSR temporary places the MDE function in a file named *static.root* which will be read by BLASIMPOST and stored in the neutral file.

BLASIMPOST: This FORTRAN module is used to post-process the BLASIM output file, *Btypiijj.OUT*, for each rotating stage. The *Btypiijj.OUT* file supplies the neutral file with the required data as shown in section C.6 of appendix C.

MTSBGEN: This FORTRAN module generates the input file to the quasi-3D fluid analysis module MTSB. The MTSB input file naming procedure is similar to the one used for the BLASIM input with one difference being in the first letter: *Mtypiijj.INP*. Unless otherwise specified, the blade model is generated based on the neutral file defaulted airfoil NACA 64-206. The airfoil data bank, *airfoil.bank*, discussed in appendix B is used to input airfoil or full blade definition. The procedure applied to generate the blade for BLASIM is used here. The MTSB input file is generated for all rotating stages. Section C.7 of appendix C shows in details the neutral file data obtained and/or generated by this module.

MTSB: This FORTRAN module provides detailed subsonic or transonic flow solution on the hub-shroud mid channel stream surface of a single blade row of turbomachine. The MTSB module is executed consecutively for all stages. Its input is read on logical unit 26. Note that MTSB does not supply directly any data to the neutral file (section C.8).

MTSBPOST: This FORTRAN module post-process data from the MTSB. output file *Mtypiijj.OUT*. Section C.9 of appendix C shows in details the neutral file data processed by this module.

NOISE: This FORTRAN module is used for the estimation of the fan tone, broad band, and jet noise. Section C.10 of appendix C shows in details the neutral file data obtained and/or generated by this module.

PREDICT: This FORTRAN module predicts gross, airframe, engine, capacity and fuel weights. Section C.11 of appendix C lists in details the neutral file data obtained and/or generated by this module.

RANGE: This FORTRAN module is executed if the defaulted RANGE is zero. Section C.12 of appendix C lists in details the neutral file data obtained and/or generated by this module.

CITY: This FORTRAN module determines the number of city pairs in US. and Western Europe. Section C.13 of appendix C lists in details the neutral file data obtained and/or generated by this module.

REPAIR: This FORTRAN module estimates mean time between engine repair, engine materials, and labor maintenance time and costs. Section C.14 of appendix C lists in details the neutral file data obtained and/or generated by this module.

DOC: This FORTRAN module is used for direct operating costs computations of aircraft including airframe and engine. A long list of parameters are computed or updated by this module beginning from cruise altitude ALT and ending with international spare prop depreciation CDPI. Section C.15 of appendix C lists in details the neutral file data obtained and/or generated by this module.

LCC: This FORTRAN module is used for cost estimation for a given year of service. The list of parameters computed by this module and placed in the neutral file begins with new jet/fan maintenance cost for first year of service NEWT1 and ends with derivative reciprocating eight year total DERRENG. These parameters are used in the computation of the projected cost for turboprop, turbojet, turbofan, and reciprocating engines. The projected cost is given as a function of year, up to 12 years. Section C.16 of appendix C lists in details the neutral file data obtained and/or generated by this module.

FLOPSGEN: This FORTRAN module generates the input file *flopsin.file* for the FLOPS module. This file contains NAMELIST input for mission performance and cost analysis. Also, through the neutral file keyword EIFILE, FLOPSGEN specifies the name of a mission data file, *nnepwate.missout*, containing thrust, fuel flow, and specific fuel consumption at various Mach number and

altitude sets. Section C.17 of appendix C lists in details the neutral file data obtained and/or generated by this module.

FLOPS: This FORTRAN code is the Flight Optimization System module. It is a multidisciplinary computer code for conceptual and preliminary design and evaluation of advanced aircraft concepts. Two input files, *flopsin.file* and *nnepwate.missout*, are required to run FLOPS. The output from FLOPS is stored in *flopsout.file*. The FLOPS NAMELIST input deck limit the analysis options to mission performance and cost assessment. To select more options, an expert user must modify the input generator FLOPSGEN which requires adding more input and output parameters to the neutral file. Note that the FLOPS module does not supply directly any data to the neutral file (section C.18).

FLOPSPOST: This FORTRAN module post-process the output from FLOPS. It updates the neutral file to include response parameters from mission performance and cost analysis. The mission summary data are printed at various time segments for climb, cruise, and descent. Some of these data are: altitude, weight, fuel flow, and thrust. The cost analysis provides direct and indirect operating cost, manufacturing cost, and return on investment. Section C.19 of appendix C lists in details the neutral file data obtained and/or generated by this module.

PCHART: This module consists of two programs: PIECHART.C and PCHART.F written in FORTRAN and C respectively. The objective of this module is to display in the form of a pie chart engine/airframe direct operating cost. The following items constitute the chart:

- captain and first officer pay
- engine fuel and oil cost
- airframe and engine material and maintenance cost
- airframe and engine depreciation
- spare airframe and engine depreciation

Note that PIECHART.C and PCHART.F are compiled then linked together to form a single executable. The input to this module is the neutral file.

BCHART: This module consists of two programs: BARCHART.C and BCHART.F written in FORTRAN and C respectively. The objective of this module is to display in the form of bar charts the mean time between repairs and the FTE repair hours cost for the following engine components: inlet, low pressure compressor, high pressure compressor, diffuser, combustor, high pressure turbine, low pressure turbine, nozzles, and shafts.

Note that the BARCHART.C and BCHART.F are compiled then linked together to form a single executable. The input to this module is the neutral file.

4.2 Format and Content of the T/BEST Neutral File

The neutral file is a central data bank system that is used as a dispository to exchange information among all modules in T/BEST. The neutral file, named *neutral.file*, resides under /user/tbest/in sub-directory. The first two lines in this file are used as a heading. Every parameter in the neutral file is represented by a unique keyword located from the 31st column to the 40th. The types of data available in the neutral file are listed below:

1. Integer with the format: 40x,i5. The integer keywords are: NCC, NSTAGE, NS, NB, IOPT, IANAL, ICOST, NVERT, NFUSE, NEW, NEF, NPF, NPT, NSTU, NGALC, NFLCR, IDLE, IGENEN, IFLAG, MSUMPT, IRW, IATA, ITTFF, IOC, NINDE, MYWTS, ICOSTP, IRAD, NPROTP, NFLTST, IBODY, ICIRC, NCHAN, NGEN, NPOD, IMUX, and ISPOOL.
2. Character with the format: 40x,a15. The character keywords are: AIRCODE, ABLDEF, TYPROC, DISMAT, EIFILE.
3. All the remaining keywords in the neutral file depicts parameters with real data type with the format: 40x, e12.5.
4. Keywords may be used to point to additional files that contain copious amount of data.

The T/BEST neutral file is a single file subdivided into blocks. Keywords may be added to any of these blocks. However, it has been determined that T/BEST execute faster if relevant data are grouped together, that is, for example, the DOC data is intermixed with the structural analysis results, a substantial amount of time is spent searching for DOC keyword. Therefore, the usage of these "blocks" of data is advantageous. Section A.5 of appendix A lists a sample neutral file.

Block # 1: Data for all engine components is found in this block. Engine components such as fans, compressors, and turbines contain stages while others such as inlet, burner and duct, do not. For fans, compressors, and turbines, detailed stage data is listed in the neutral file. Component data (speed, length etc.) comes ahead of stage data (blade dimensions and material type). The parameters used to describe compressors or turbines and their corresponding stages are similar to those used for fans. Component number and type are used to identify data associated with fans, compressors, and turbines.

The parameters used to describe the stage in the neutral file are obtained from NNEPWATE, BLASIM, and MTSB. From the stage number NS to the keyword MATSLC are obtained from NNEPWATE output. The next two parameters AIRCODE and ABLDEF are set by default in the file. Data beginning with the blade untwist UTWIST to the impact root damage function ROOTD are obtained from BLASIM while the efficiencies that follow come from MTSB.

Block # 2: The second data block contains parameters for direct operating cost. These parameters are set by default may be changed at the start of the execution of T/BEST as seen in the previous section. This block is titled "GLOBAL VARIABLES 1 - AIRCRAFT - DOC".

Block # 3: The third data block lists various parameters that can be used for noise estimation. Parameters with the keywords XFLOW, XVR, XRPM, XGAP, XCHORD, RI and RO are extracted from the NNEPWATE output while the remaining variables are set by default. This block is titled "GLOBAL VARIABLES 2 - NOISE "

Block # 4: The parameters described here are obtained from the NNEPWATE output and extracted for the corresponding cruise altitude and Mach number. The data here pertains to parameters used in mission analysis (thrust, fuel, velocity, etc....). Also, for each component, inlet and outlet temperatures and pressure are given.

Block # 5: This block begins with the cruise altitude ALT and ends with the low pressure turbine materials cost LTCOST. This segment of the neutral file is dedicated for repair, maintenance and cost data of the aircraft. This block of data is initialized (defaulted) at the start of T/BEST execution and stored in *neutral.add* file located in */user/tbest/in* sub-directory (section C.1 of appendix C). The parameters in this block may be updated as demonstrated in section 3.0. Changing the actual values of defaulted parameters is carried out during the execution of NEUTGEN if *neutral.add* file did not pre-exist.

Block # 6: This block contains data for the FLOPS module. It begins with the heading "BEGIN FLOPS DATA" and ends with "END FLOPS DATA". The data included in this block pertains to mission performance and cost analysis input and output as described in sections C.17, C.18, and C.19 of appendix C.

4.3 T/BEST Shell Script

The execution of T/BEST is managed and controlled by a shell script named *tbest.exe*. The script is a Bourne shell which is equivalent to a set of command language interpreter. With the Bourne shell, compilation is not required and its commands can be directly executed. In the shell script, the execution of T/BEST modules starts with NEUTGEN in a clockwise sequence and ends with BCHART as shown in Figure 4.1. A complete listing of the T/BEST shell script is given in section D.1 of appendix D.

4.4 Compilation and Linking of T/BEST Modules

The compilation and linking commands, shown in bold letters, are valid on all SGI workstations with IRIX operating system (version of UNIX).

To compile a FORTRAN module:	f77 -c -static code.f
To link the object file of the FORTRAN module:	f77 -o exe code.o
To compile a C module:	cc -c source.c
To link the object file of the C module:	cc -o exe source.o

To link FORTRAN and C together (applies for PCHART and BCHART):

```
f77 -o exe source.o code.o -lgl_s
```

A unique compilation and linking capability has been embedded in the T/BEST executive system. Any module in T/BEST which executable does not exist in the T/BEST exe sub-directory is automatically compiled and linked. This capability is very helpful, especially when loading T/BEST on workstations that operate under various operating system. A file that contains a listing of all modules in T/BEST is located in the */user/tbest* mother directory. This file is named *list.exe files*. A listing of this file is shown in section D.2 of appendix D. Note that the executable of every T/BEST module is named *module.exe*.

4.5 T/BEST Blade Material Data Bank

The BLASIM module in T/BEST performs structural analyses on fan, compressor and turbine blades. For now, it is assumed that the blade is made-up of a single material (solid blades). However, BLASIM is capable of handling additional types of blades: superhybride, hollow, and composite. The material properties for composite blades [Ref. 2] are computed via ICAN [Ref. 10] which is included in BLASIM. The single material that is used to construct the blade is selected among any matrix that is listed in the data bank (section D.3 of appendix D).

SECTION 5.0

DESCRIPTION OF DEFAULT T/BEST ANALYSES MODULES

5.1 Thermodynamic and Flow Path Analysis (NNEPWATE Module)

The NNEPWATE [Ref. 1] module is a FORTRAN code that combine two NASA LeRC in-house computer programs:

1. NNEP89 [Ref. 1.a] : Navy/NASA engine program used for engine cycle analysis.
2. WATE89 [Ref. 1.b]: Weight Analysis of Turbine Engines.

5.1.1 Thermodynamic Engine Cycle Analysis (NNEP89)

The NNEP89 code conducts one dimensional steady state thermodynamic analysis of turbine engine cycles. In the NNEP89 input file, a set of standard components are connected to simulate almost any turbine engine configuration. Off-design performance is calculated through the use of component performance maps. The compressor and turbine performance maps are scaled by the code to match the design point pressure ratio, corrected weight flow and efficiency of the engine being modeled. The NNEP89 code allows the user to model multimode engines that change configurations over various portions of their flight regimes. By default, the thermodynamic routine in the code is preset for mixtures of air and JP4 fuel. An optional chemical equilibrium model can predict thermodynamic properties when chemical dissociation occurs as well when using virtually any fuel.

In general, two input files are required to execute the NNEP89 code. The first contains inputs which indicate what components will be used and how those components are configured to form a specific engine model. Detailed inputs for each of these components describe the desired component model. Also included in this input file are global inputs which control program input/output, execution, optimization, turbine cooling, thermodynamic property calculations, and installation effects calculations. The second input file contains all performance map tables which are generally used to model off design performance of components such as compressors and turbines. The capability of NNEP89 is extended beyond thermodynamic analysis by coupling it to the WATE code.

5.1.2 Initial Engine Sizing (WATE89)

The WATE89 code has been developed to estimate an initial engine weight from corrected data and major envelope dimensions of large axial flow aircraft jet engines and small gas turbine engines. The code determines the weight of each major component in the engine, such as compressors, burners, turbines and frames. A preliminary design approach is used where the stress level, maximum temperature, material, geometry, stage loading, hub-tip ratio, and shaft mechanical overspeed are used to determine the component weight.

A relatively high level of detail was found to be necessary in order to obtain a total engine weight within a reasonable accuracy. Component weight data for many engines were used as a data base to develop the method for axial flow aircraft engines. The list of engines includes military and commercial, turbofans and turbojets, augmented and dry, supersonic and subsonic, and small gas turbines. A thermodynamic simulation of each engine in the data base was made in order to obtain correlated airflows, temperatures, pressures, etc., data on each component.

The input file for the NNEPWATE code consists of two parts: input for NNEP89 followed by the input for WATE89.

5.2 Blade Assessment for Ice Impact (BLASIM Module)

BLASIM [Ref. 2] (BLade ASsessment with Ice iMpcat) is a NASA LeRC computer code written in FORTRAN 77 for the structural analysis of engine blades. The analysis capabilities of the BLASIM code are: local and root ice impact damage, local and root Foreign Object Damage (FOD), static, dynamic, resonance margin calculations, flutter, and fatigue. BLASIM can handle the following blade types: solid, hollow, superhybrid and composite. The solid blade is made up of a single material where as hollow and superhybrid blades are constructed with prescribed composite lay-up. For composite blades, BLASIM utilizes ICAN (Integrated Composite ANalyzer [Ref. 10]) to generate the temperature/moisture dependent ply properties of the composite blade.

Two types of geometry input can be given: NASTRAN type finite element grid or airfoil coordinates. This option increases the flexibility of the program. But in T/BEST, the BLASIM code input is generated based on a selected airfoil or full blade geometry (detailed airfoils) entered in the airfoil data bank.

In T/BEST, the BLASIM code is used to analyze every row of rotor blades for each stage of each fan, compressor and turbine. By default, the analyses include most of the general capabilities of BLASIM. The foreign object damage option is optional and is activated by selecting a foreign object velocity, density and size. The impact location is determined based on two fractions determining the upper

and lower bounds for the impact region. The values of the foreign object damage parameters are set to zero in the neutral file. Once these parameters are updated, the input to the BLASIM code will include this option.

5.3 Meridional-Transonic Boundary Layer Fluid Analysis (MTSB Module)

MTSB [Ref. 3] is a NASA LeRC computer program that is developed to obtain a detailed subsonic or transonic flow solution on the hub-shroud mid channel stream surface of a single blade row or turbomachine. The flow must be essentially subsonic, but there may be locally supersonic flow. The blade row may be fixed or rotating, and the blades may be twisted and leaned. The flow may be axial, mixed, or radial. Upstream and downstream flow conditions can vary from hub to shroud, and provision is made for an approximate correction for loss of stagnation pressure. Viscous forces are neglected along solution mesh lines running from hub to tip.

The basic analysis is based on the stream function and consists of the solution of the simultaneous, nonlinear, finite difference equations of the stream functions. This basic solution, however, is limited to strictly subsonic flow. When there is locally supersonic flow, a transonic solution must be obtained. The transonic solution is obtained by a combination of a finite-difference, stream function solution and a velocity gradient solution. The finite-difference solution at a reduced mass flow provides information that is used to obtain a velocity-gradient solution at the full mass flow. The blade geometry used in the execution of the MTSB module is again based on the airfoil selected from *airfoil.bank* file.

The MTSB output file provides the neutral file for each stage of each rotating component with detailed efficiencies: kinetic or overall, profile, endwall, section loss, incidence, clearance, windage, and sum rotor.

5.4 Noise Analysis (NOISE Module)

This module estimates the fan tone, broadband, and jet noise [Ref. 4] for turbojet and turbofan propulsion systems. Attenuation lining characteristics, attenuation spectra, are indicated for obtaining the required target perceived noise level (Pndbl). The inputs to the program are the fan flow rate, tip relative speeds, rotor stator axial gap, blade count, jet velocity, nozzle area and length, ambient temperature, relative humidity, inlet and aft duct flow areas, and target perceived noise level. The output is the perceived noise level (Pndbl) at 500 ft. sideline distance and at 50 and 120 degrees from the engine axis. The required lining attenuation characteristics, attenuation as a function of frequency, are indicated in the scratch output file, *noise.scratch2*, in the */usr/tbest/wrk* sub-directory.

5.5 Statistical Predictions (PREDICT Module)

This module [Ref. 5] estimates the gross, airframe, engine, capacity and fuel weights of aircraft given any one or more of these variables. The role of the PREDICT program is to yield reasonable estimates of the above parameters when none are given. The estimates are obtained from linear regression analyses (using SAS) of a data set containing specification of 31 aircraft and 21 engines covering a gross weights from 90700 to 870000 lbs, two to four engines, cruise speeds from 566 miles per hour to MACH 0.85, ranges from 1120 to 8720 miles, thrust levels from 14000 to 61500 lbs, and capacities from 30700 to 243500 lbs.

Over seventy linear regression equations have been developed and these can be obtained directly from the source code along with their respective correlation coefficients. Section D.2 of appendix D contains a listing of the data base used in the PREDICT module.

5.6 Range Analysis (RANGE)

This module determines the Brequet [Ref. 6] range and includes a corrected range determined from historical data. This corrected range is based on the results of a linear regression analysis of actual flight ranges data versus ranges predicted by the Brequet range. The data base used for the regression analysis is same as that is used in the PREDICT module. The corrected data is not meant to indicate that the Brequet ranges are invalid. The corrected range is indicated to be more representative for the more complex flight paths of commercial aircraft. The inputs are the specific fuel consumption, cruise velocity, lift to drag ratio, and take-off and landing weights.

5.7 City Pairs (CITY Module)

This module [Ref. 7] determines the number of city pairs in the United States and Europe that can be reached given the range of the aircraft. The data for the United states is incomplete and needs to be extended to include city pairs greater than 3000 miles.

5.8 Maintenance Between Repair (REPAIR Module)

This module estimates the mean time between repair, engine materials and labor maintenance costs from historical data. The correlations are from "A New Method for Estimating Transport Direct Operating Costs" [Ref. 8]. The input data includes fan, low and high pressure compressor and turbine, and combustor inlet and exit temperatures and pressures. The fan, low and high pressure compressor

and turbine diameters, rotations per minute and first stage tip speeds, etc. are input to the program in addition to the acquisition cost (price) of a replacement component, e.g., low pressure compressor price. The output of the program are the mean time between repair, repair hours, and repair cost.

5.9 Direct Operating Cost (DOC Module)

This module estimates the direct operating costs (DOC) of aircraft (reciprocating engine, turboprop, turbofan, and turbojet) airframe and engines. The model is from the Air Transportation Association and should be upgraded to the current date. The reader should refer to "Standard Method of Estimating Comparative Direct Operation Costs of Transport Airplanes" [Ref. 9]. Typical inputs included the total fuel consumed, Civil Aviation Board trip length, number of engines, gross, landing, and engine weights, engine thrust, ground speed, specific fuel consumption, acquisition, fuel and oil costs, and insurance, crew, depreciation rates, etc. The outputs are indicated in \$/mile and include the crew, fuel, engine and airframe maintenance material, labor, and burden costs. Depreciation of spare parts and equipment and insurance costs are also available. Both domestic and international costs are indicated.

5.10 Life Cycle Maintenance (LCC Module)

This module estimates the engine maintenance costs [Ref. 8], per aircraft, for a given year. The engine maintenance costs used in the determination of the engine and airframe direct operating costs are those costs where the engine maintenance costs are approximately constant per year, i.e., about the 9th year of engine service. The inputs are the number of engines per aircraft, block time and block speed, and the ninth year direct operating maintenance costs. The outputs include estimates of the engine maintenance costs as a function of the year of service and whether the engine is a derivative engine or a new technology engine.

5.11 Flight Mission Summary (FLOPS Module)

FLOPS [Ref. 11] release 5.4 is included in T/BEST for mission and cost analyses. The FLOPS module, written in FORTRAN and developed at NASA Langley Research Center, consists of nine primary modules: weights, aerodynamics, engine cycle analysis, propulsion data scaling and interpolation, mission performance, takeoff and landing, noise footprint, cost analysis, and program control. For now, two FLOPS capabilities, mission performance and cost analysis are used in T/BEST.

The FLOPS mission performance capability uses the calculated weights, aerodynamics, and the NNEPWATE propulsion system data to calculate

performance. Optimum climb profiles may be flown to start of cruise conditions. The cruise segments may be flown at the optimum altitude and Mach number for maximum range. Descent may be flown at the optimum lift-drag ratio.

The cost analysis capability expands beyond what is obtained through the DOC module discussed in section 5.9. The FLOPS cost capability includes detailed airframe costs, engine development and production costs, direct and indirect operating costs, fare cost, and return on investment.

SECTION 6.0

PARAMETRIC STUDIES

The T/BEST neutral file provides the user with results for all analyses modules. But in this section, results from BLASIM, MTSB, and FLOPS obtained at the end of a typical T/BEST run are plotted to show the user how to process and interpret some neutral file data. Emphasis is placed on blade structural response parameters, efficiencies obtained through flow analysis, and mission performance.

6.1 Blade Structural Response

The BLASIM module is responsible for conducting structural analysis of fan, compressor and turbine blades. Data from the following analyses capabilities are listed in neutral file: static, modal, fatigue, resonance margin, and foreign object damage. The structural response shown here is restricted to data for the high pressure compressor (HPC). It is the fifth component in the engine and contains five stages.

Figure 6.1 shows the root static stress for each stage and the modified Distortion Energy Criterion (MDE) function response [Ref. 10]. Failure will occur if the MDE function is greater than 1.0.

Figure 6.2 shows the untwist and uncamber of the blade at all stages of the compressor. The blade is constructed with NACA 64-206 airfoils.

Natural frequencies for the first five modes at the operating speed (7648 rpm) are shown in Figure 6.3. Note that the T/BEST neutral file lists also the frequencies at minimum and maximum rotor speeds.

6.2 Efficiencies for the High Pressure Compressor

The efficiencies shown here are those obtained for all the stages of the high pressure compressor. Figure 6.4 shows the efficiency change due to profile, endwall, secondary loss, incidence, clearance and windage. The overall efficiency for all five stages is plotted in Figure 6.5. Note that the overall efficiency decreases from 89.4% at the first stage to 76.6% at the last stage.

6.3 Mission Summary

The FLOPS module provide the neutral file of the T/BEST executive system with detailed mission performance at all flight segments: climb, cruise, and descent. Two responses at all flight segments have been plotted in this section: Mach number (Figure 6.6) and aircraft gross weight (Figure 6.7). The aircraft gross weight decreases as the flight time increases because the fuel is being consumed.

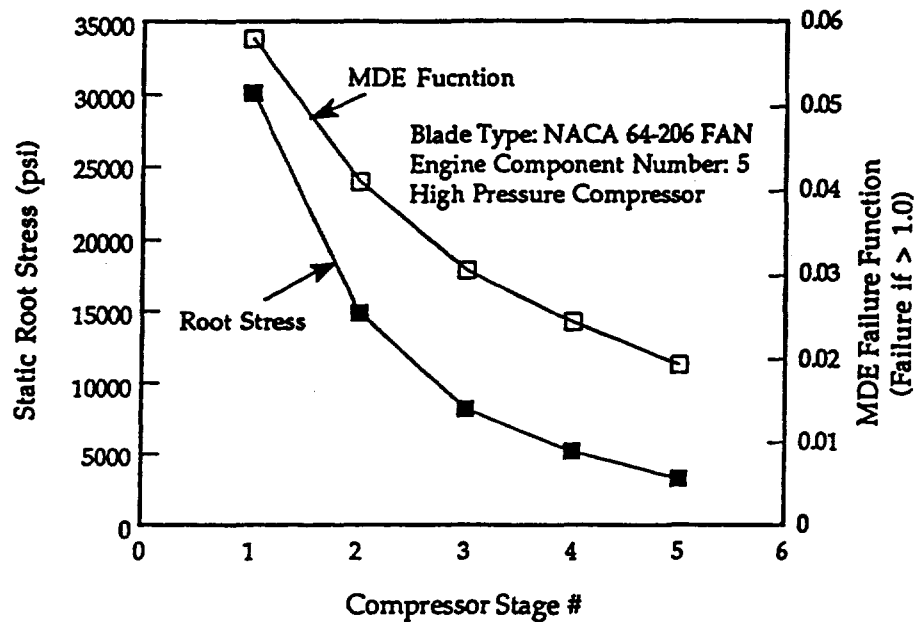


Figure 6.1 Blade Structural response: Static Root Stress Level and MDE Failure Function

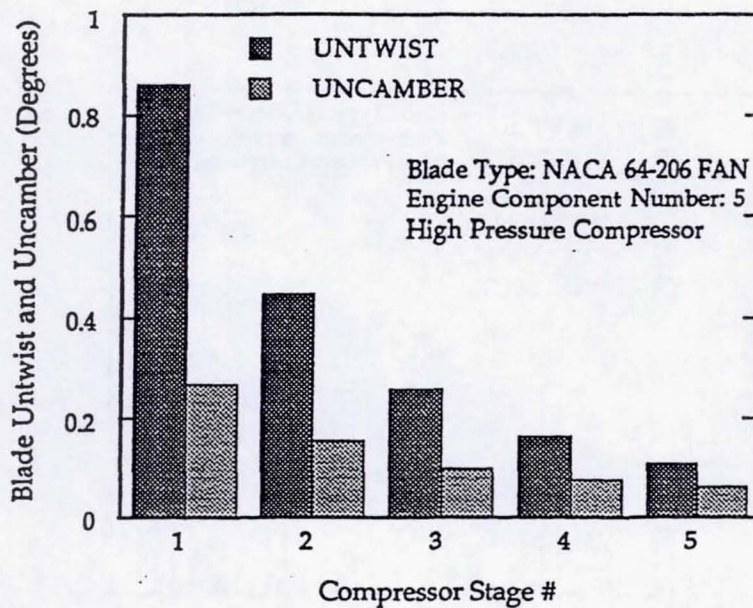


Figure 6.2 Blade Structural response: Untwist and Uncamber

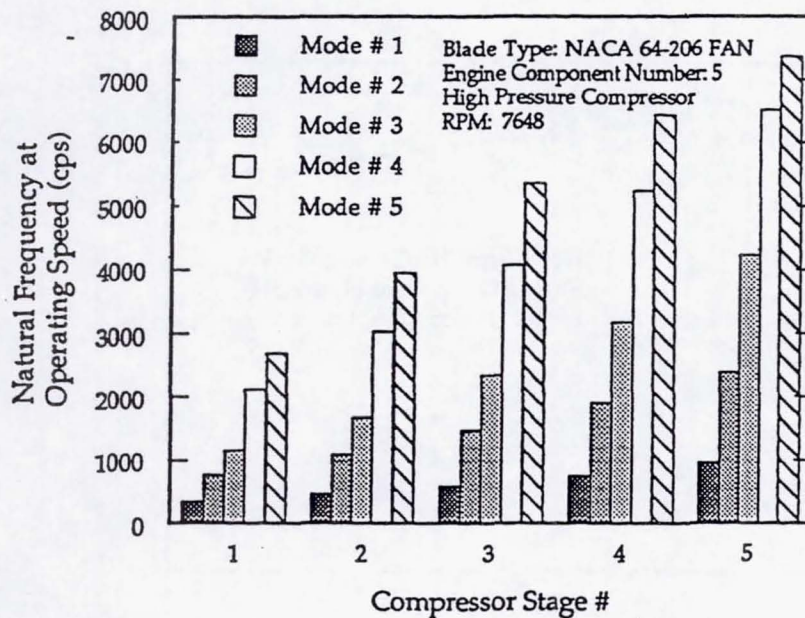


Figure 6.3 Blade Modal response: Natural Frequencies of the First Five Modes

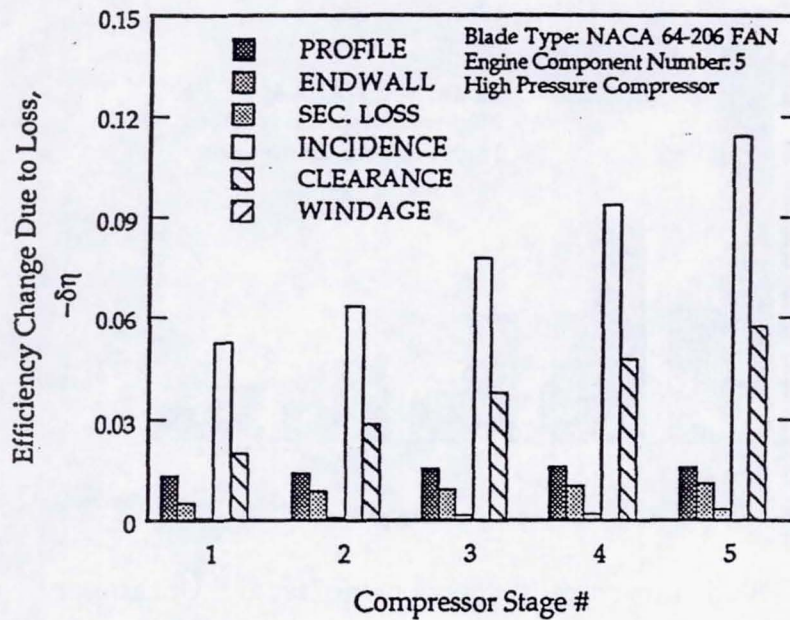


Figure 6.4 Compressor Efficiency Changes Due to Loss

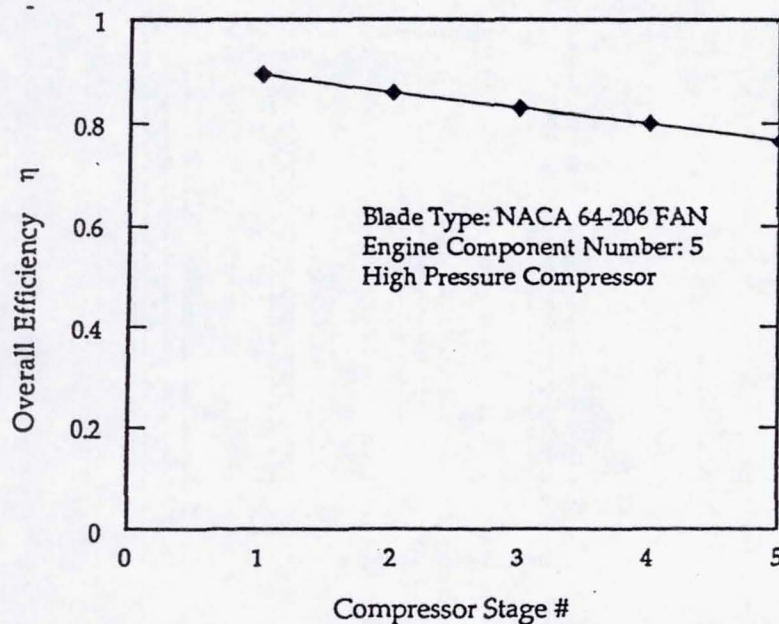


Figure 6.5 High Pressure Compressor Stages Overall Efficiency

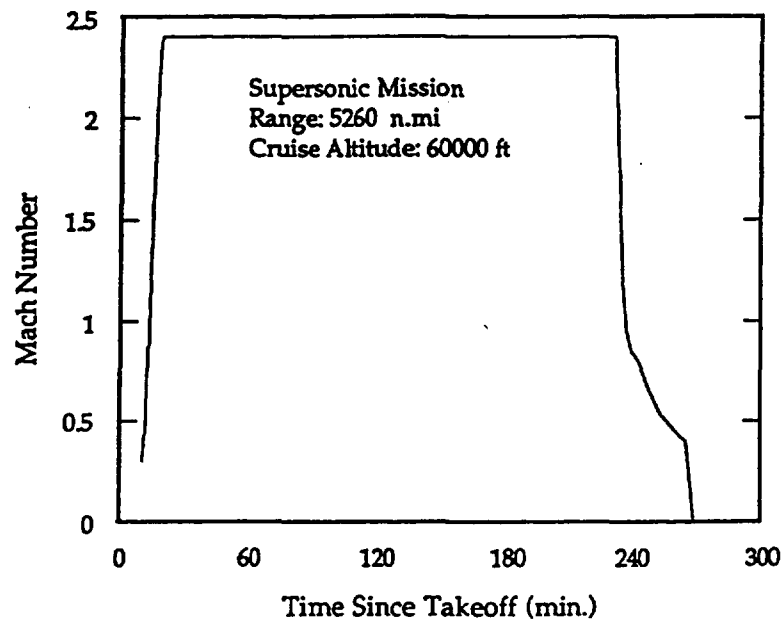


Figure 6.6 Mission Performance: Mach Number at Climb, Cruise, and Descent.

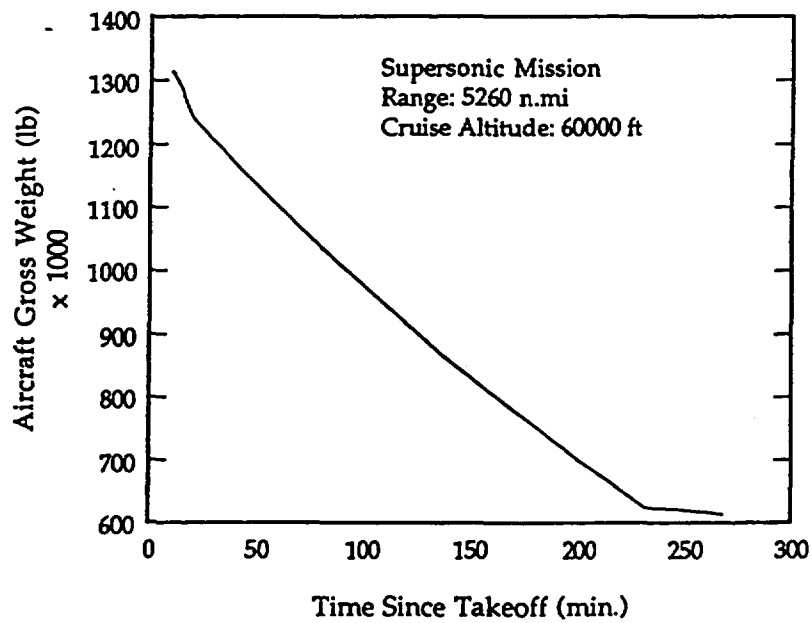


Figure 6.7 Mission Performance: Aircraft Gross Weight at Climb, Cruise, and Descent.

SECTION 7.0

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APPENDIX A

DESCRIPTION OF DEMONSTRATION EXAMPLE

A.1 Description of the Supersonic Engine

The example used here pertain to a high speed aircraft with maximum velocity of 2.4 Mach number and cruise altitude of 60000 ft. The aircraft is capable of carrying up to 250 passengers with a range of 5000 nautical mile. The supersonic engine operates under constant design thrust with scale factor on corrected weight flow of 0.999.

The NNEPWATE module is used for engine cycle analysis and weight estimation. Here, it is required to provide the mechanical and thermodynamic connection of the engine in consideration through a set of inputs. To execute NNEPWATE, two files are required: engine input and performance map files. Complete details on input files generation for the NNEPWATE code are found in reference [1].

A block diagram of the engine in consideration is shown in Figure A.1. Engine components 2 and 5 characterize a fan and a high pressure compressor consisting of two and five stages respectively. But engine components 8 and 9 depict a high and a low pressure turbines with one and two stages respectively. The flow splits at the third engine component and ends in a nozzle (component number 14). Ducts or burners in Figure A.1 are defined using the keyword "DUCT B". Only engine component number 7 is a burner and the remaining "DUCT B" components are ducts to bypass the flow. The NNEPWATE input and map files are listed in sections A.3 and A.4 of this appendix.

The output file obtained when running NNEPWATE has the extension ".output" and is stored permanently in the T/BEST output sub-directory. The NNEPWATE output file provides the T/BEST neutral file with thermodynamic properties of the flow at each station in addition to weight and length of each components through the engine. Also, the output file provides general parameters that can be used in the construction of the fan, compressor, and turbine blades. These parameters are: hub to tip ratio, hub and tip radii, and the blade aspect ratio.

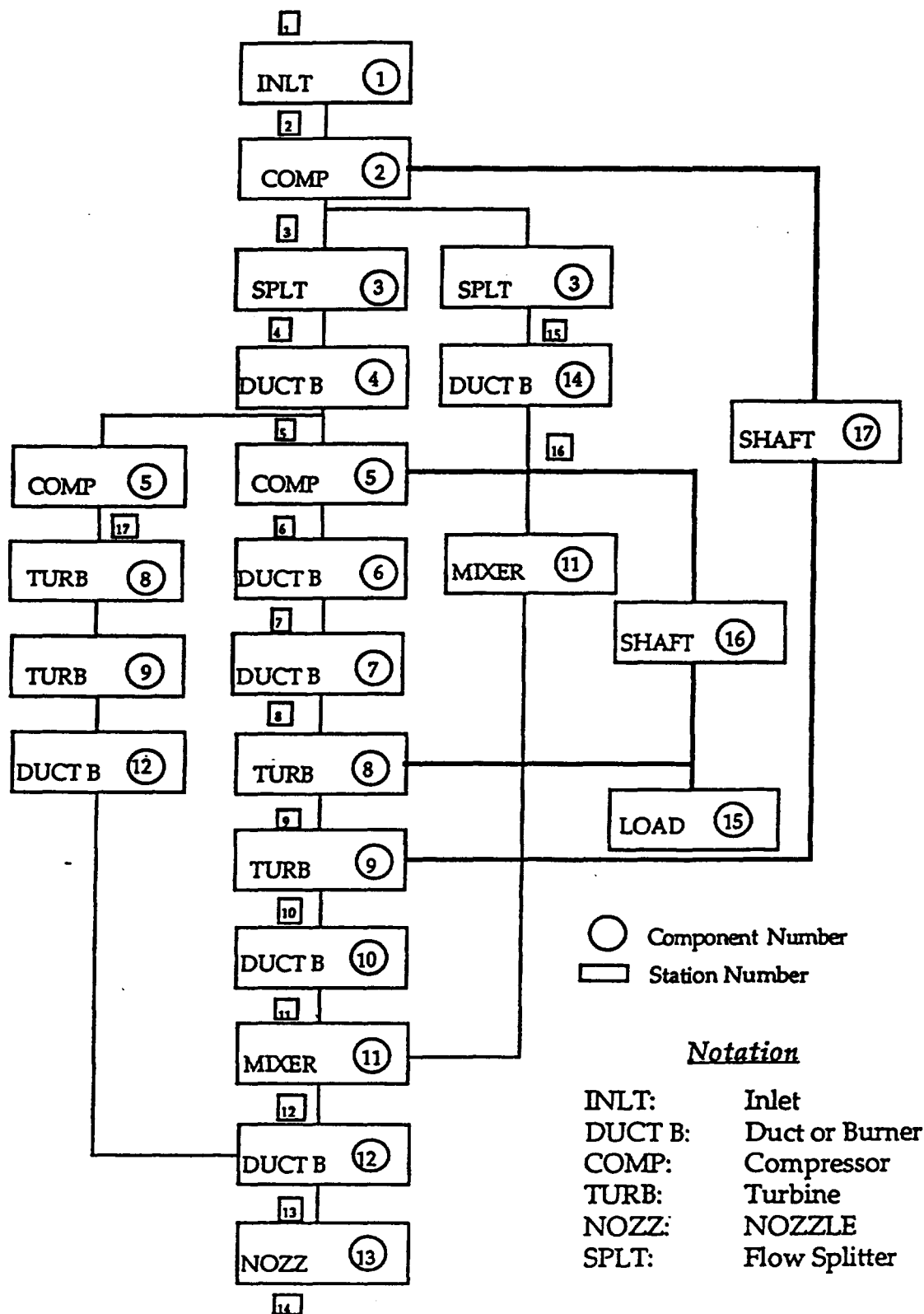


Figure A.1 Block Diagram of a Supersonic Research Engine

A.2 Construction of Fan, Compressor and Turbine Blades

The blade constitutes the most fundamental element of engine rotating components (fan, compressor, and turbine). Structural failure of the blade can cause the engine to fail and subsequently placing the passengers as well as the aircraft at risk. The blade structural analysis is done using the BLASIM code. Prior to analyzing the blade, a complete geometric description is required. Several blade geometric parameters such as aspect ratio, hub to tip ratio, and hub and tip radii are obtained from the NNEPWATE output file then stored in the T/BEST neutral file. These parameters are taken into account when generating the blade geometry.

An airfoil data bank is used as a basis for the full construction of the blade. The user may store and update pre-defined airfoils or may provide the full blade geometry in the airfoil data bank file named *airfoil.bank*.. This capability allows the user to build-up a library of airfoils that can be used efficiently in engine component design. The airfoil data bank file resides in the *tbest/in* sub-directory.

In this example, blade geometry is needed for the following components:

1. Component number 2 (two stages), type: fan
2. Component number 5 (five stages), type: high pressure compressor
3. Component number 8 (one stages), type: high pressure turbine
4. Component number 9 (two stages), type: low pressure turbine

Figure A.2 shows a plot of the NACA 64-206 airfoil that is used to generate the geometry at each stage for the rotating components that are listed above. Note that the fan and compressor use the same airfoil. The format and content of the airfoil data bank are fully described in appendix B. The airfoil used in this example is the defaulted one in T/BEST. The airfoil data bank is flexible enough to allow the user to add new airfoils. The airfoil data bank accepts two types of blade definition: airfoil and full geometry of the blade.

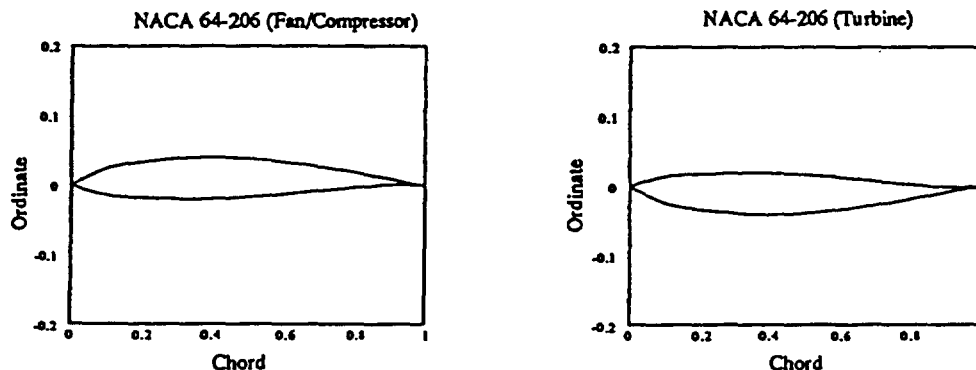


Figure A.2 Default Airfoil Used for Fan, Compressor and Turbine Blades

A.3 Listing of *supersonic.input*

The NNEPWATE module consists of two combined codes: NNEP for engine cycle analysis and WATE for weight estimation [Ref. 1]. The input file to NNEP and WATE is combined in a single file with the extension ".input".

The first block of the input file is associated with the NNEP input. The input begins with a global namelist where the following categories may be defined: input and output options, execution control, optimization, turbine cooling, and thermodynamic properties.

Here the user must specify the components that make up the engine. Flow stations for flow leaving and entering a component must be defined as well. These flow stations inform the NNEP code how the engine components are connected. Some restriction apply in assigning the component and station numbers. For example, the primary inlet must always be given a component number of one. The KONFIG array is used to provide the information needed to define the configuration of the engine. In this example, the first numeric value of the KONFIG array identifies the component type used. For more details, refer to the NNEP code user's manual.

The second block of this input file is associated with the WATE input. The IWMEC and DESVAL arrays are used in providing the WATE input for the components defined in the first block. For example, if the component type is fan/compressor, the IWMEC array can be used to specify indicators for stator, frame, and gear box. For the same component, the DESVAL array is used to specify: entrance MACH number, blade material density and aspect ratio, and compressor design type etc.. For a complete description of the WATE input, refer to the WATE code user's manual [Ref. 1].

Listing of "supersonic.input"

```

TF3 - INSTALLED ENGINE MATRIX (FULL & PART POWER)
&D AMAC=T,MAPLOT=F,NMODES=1,MODESN=1,NCODE=-1,LONG=F,DOUTHDT=T,
CALBLD=F,MAXNIT=100,ITERM=0,T4TOC=3499,P4TOC=193.5,WATOC=186.9,
T3MAX=1710,BOAT=T,IWT=1,&END
&D MODE=1,
/* UPDATED MAY 94 TO GENERATE FLOPS MISSION DATA */
KONFIG(1,1)=1, 1, 0, 2, 0,SPEC(1,1)=0.3*0,0,0.932,2*0,.00001,4*0,744.56,
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0,0,.873,3.8,.995,
KONFIG(1,3)=7, 3, 0, 4,15,SPEC(1,3)=0.20,0.01,0.01,
KONFIG(1,4)=2, 4, 0, 5, 0,SPEC(1,4)=8*0,
KONFIG(1,5)=4, 5, 0, 6,17,SPEC(1,5)=1.47,.230,1,2120,1,2121,1,2122,1,
1,.18,.898,3.5,1.,
KONFIG(1,6)=2, 6, 0, 7,18,SPEC(1,6)=8*0,.0035,
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.140,0,5,
KONFIG(1,8)=5, 8,17, 9, 0,SPEC(1,8)=2.5,.565,1,3801,1,3802,1,1,
.523,1,.905,5680,1,0,1,
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0.80,11,5531.,
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KONFIG(1,15)=10, 0, 0, 0, 0,SPEC(1,15)=-200.,
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KONFIG(1,20)=12,SPCNTL(1,20)=1,2,200,5,2,20.01,1,
/*      CNTLs That are Always On      */
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Listing of "supersonic.input" (Continued)

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&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .346566D+03,SPEC(1,9)= .183293D+01,SPEC(1,8)= .251027D+01,
SPEC(4,7)= .337509D+04,SPEC(9,6)= .340143D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148362D+01,SPEC(1,3)= .559823D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .101344D+01,SPEC(1,17)= .101721D+01,
SPEC(1,22)= .106559D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .112282D+01,
SPEC(9,18)=0,SPEC(9,19)=0,SPEC(9,20)=0,SPEC(12,1)=18,
SPEC(9,23)=1,SPEC(9,24)=1,SPEC(9,25)=1,SPEC(9,26)=1,
SPEC(9,27)=1,SPEC(9,28)=1,SPEC(9,29)=.005,SPEC(9,30)=0,
&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .331311D+03,SPEC(1,9)= .186499D+01,SPEC(1,8)= .251983D+01,
SPEC(4,7)= .331733D+04,SPEC(9,6)= .348087D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149024D+01,SPEC(1,3)= .596194D+00,SPEC(1,2)= .137304D+01,
SPEC(14,1)= .649977D+03,SPEC(1,16)= .100848D+01,SPEC(1,17)= .101638D+01,
SPEC(1,22)= .110394D+01,SPEC(5,34)= .226935D+02,SPEC(8,13)= .110276D+01,
&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .263860D+03,SPEC(1,9)= .202276D+01,SPEC(1,8)= .255548D+01,
SPEC(4,7)= .309229D+04,SPEC(9,6)= .358107D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151150D+01,SPEC(1,3)= .635216D+00,SPEC(1,2)= .134877D+01,
SPEC(14,1)= .647249D+03,SPEC(1,16)= .993734D+00,SPEC(1,17)= .101174D+01,
SPEC(1,22)= .133212D+01,SPEC(5,34)= .209775D+02,SPEC(8,13)= .105402D+01,
&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .301647D+03,SPEC(1,9)= .202205D+01,SPEC(1,8)= .256169D+01,
SPEC(4,7)= .296646D+04,SPEC(9,6)= .393879D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151342D+01,SPEC(1,3)= .736171D+00,SPEC(1,2)= .145509D+01,
SPEC(14,1)= .624783D+03,SPEC(1,16)= .974641D+00,SPEC(1,17)= .971757D+00,
SPEC(1,22)= .134905D+01,SPEC(5,34)= .294708D+02,SPEC(8,13)= .102581D+01,
&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .320503D+03,SPEC(1,9)= .198784D+01,SPEC(1,8)= .256576D+01,
SPEC(4,7)= .284031D+04,SPEC(9,6)= .431148D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151426D+01,SPEC(1,3)= .790804D+00,SPEC(1,2)= .147986D+01,
SPEC(14,1)= .588755D+03,SPEC(1,16)= .956118D+00,SPEC(1,17)= .913656D+00,
SPEC(1,22)= .134966D+01,SPEC(5,34)= .334638D+02,SPEC(8,13)= .100974D+01,
&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .337614D+03,SPEC(1,9)= .194938D+01,SPEC(1,8)= .257077D+01,
SPEC(4,7)= .272100D+04,SPEC(9,6)= .471984D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151495D+01,SPEC(1,3)= .842326D+00,SPEC(1,2)= .148033D+01,
SPEC(14,1)= .553274D+03,SPEC(1,16)= .938634D+00,SPEC(1,17)= .854788D+00,
SPEC(1,22)= .134885D+01,SPEC(5,34)= .365699D+02,SPEC(8,13)= .100120D+01,

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Listing of "supersonic.input" (Continued)

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&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .348853D+03,SPEC(1,9)= .189822D+01,SPEC(1,8)= .257468D+01,
SPEC(4,7)= .260189D+04,SPEC(9,6)= .514822D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151517D+01,SPEC(1,3)= .879426D+00,SPEC(1,2)= .145779D+01,
SPEC(14,1)= .517452D+03,SPEC(1,16)= .921196D+00,SPEC(1,17)= .797254D+00,
SPEC(1,22)= .134192D+01,SPEC(5,34)= .383853D+02,SPEC(8,13)= .100093D+01,
&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .372566D+03,SPEC(1,9)= .178919D+01,SPEC(1,8)= .255859D+01,
SPEC(4,7)= .250098D+04,SPEC(9,6)= .569642D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150944D+01,SPEC(1,3)= .907345D+00,SPEC(1,2)= .141548D+01,
SPEC(14,1)= .474591D+03,SPEC(1,16)= .901178D+00,SPEC(1,17)= .732568D+00,
SPEC(1,22)= .126482D+01,SPEC(5,34)= .395136D+02,SPEC(8,13)= .100566D+01,
&END
&D MACH= .00,ALTP= 0.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .385382D+03,SPEC(1,9)= .173706D+01,SPEC(1,8)= .254565D+01,
SPEC(4,7)= .239456D+04,SPEC(9,6)= .623469D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150646D+01,SPEC(1,3)= .950810D+00,SPEC(1,2)= .138464D+01,
SPEC(14,1)= .443508D+03,SPEC(1,16)= .882470D+00,SPEC(1,17)= .687817D+00,
SPEC(1,22)= .125630D+01,SPEC(5,34)= .399739D+02,SPEC(8,13)= .101885D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .407560D+03,SPEC(1,9)= .180127D+01,SPEC(1,8)= .249886D+01,
SPEC(4,7)= .345605D+04,SPEC(9,6)= .318635D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147299D+01,SPEC(1,3)= .549638D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .102052D+01,SPEC(1,17)= .102127D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .116414D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .338581D+03,SPEC(1,9)= .184189D+01,SPEC(1,8)= .251296D+01,
SPEC(4,7)= .337918D+04,SPEC(9,6)= .322493D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148595D+01,SPEC(1,3)= .567407D+00,SPEC(1,2)= .134271D+01,
SPEC(14,1)= .649594D+03,SPEC(1,16)= .101583D+01,SPEC(1,17)= .102030D+01,
SPEC(1,22)= .107754D+01,SPEC(5,34)= .204501D+02,SPEC(8,13)= .114308D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .273862D+03,SPEC(1,9)= .196902D+01,SPEC(1,8)= .254442D+01,
SPEC(4,7)= .316605D+04,SPEC(9,6)= .335862D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150724D+01,SPEC(1,3)= .621985D+00,SPEC(1,2)= .135175D+01,
SPEC(14,1)= .645455D+03,SPEC(1,16)= .100029D+01,SPEC(1,17)= .101244D+01,
SPEC(1,22)= .125891D+01,SPEC(5,34)= .212601D+02,SPEC(8,13)= .108719D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .284103D+03,SPEC(1,9)= .201172D+01,SPEC(1,8)= .255881D+01,
SPEC(4,7)= .300684D+04,SPEC(9,6)= .361016D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151250D+01,SPEC(1,3)= .691894D+00,SPEC(1,2)= .139640D+01,
SPEC(14,1)= .626365D+03,SPEC(1,16)= .981986D+00,SPEC(1,17)= .979001D+00,
SPEC(1,22)= .134292D+01,SPEC(5,34)= .253820D+02,SPEC(8,13)= .105003D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .312578D+03,SPEC(1,9)= .198551D+01,SPEC(1,8)= .256311D+01,
SPEC(4,7)= .288708D+04,SPEC(9,6)= .397412D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151356D+01,SPEC(1,3)= .766766D+00,SPEC(1,2)= .145764D+01,
SPEC(14,1)= .594180D+03,SPEC(1,16)= .963700D+00,SPEC(1,17)= .926783D+00,
SPEC(1,22)= .134164D+01,SPEC(5,34)= .315682D+02,SPEC(8,13)= .102551D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .329729D+03,SPEC(1,9)= .194959D+01,SPEC(1,8)= .256834D+01,
SPEC(4,7)= .276574D+04,SPEC(9,6)= .435024D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151448D+01,SPEC(1,3)= .818233D+00,SPEC(1,2)= .146203D+01,
SPEC(14,1)= .558627D+03,SPEC(1,16)= .946128D+00,SPEC(1,17)= .868098D+00,

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Listing of "supersonic.input" (Continued)

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SPEC(1,22)= .134247D+01,SPEC(5,34)= .346943D+02,SPEC(8,13)= .100977D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .341291D+03,SPEC(1,9)= .186884D+01,SPEC(1,8)= .256807D+01,
SPEC(4,7)= .264919D+04,SPEC(9,6)= .476736D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151341D+01,SPEC(1,3)= .838162D+00,SPEC(1,2)= .142311D+01,
SPEC(14,1)= .515331D+03,SPEC(1,16)= .927758D+00,SPEC(1,17)= .800683D+00,
SPEC(1,22)= .130278D+01,SPEC(5,34)= .356154D+02,SPEC(8,13)= .100257D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .382045D+03,SPEC(1,9)= .176861D+01,SPEC(1,8)= .254939D+01,
SPEC(4,7)= .255525D+04,SPEC(9,6)= .531375D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150663D+01,SPEC(1,3)= .892603D+00,SPEC(1,2)= .141519D+01,
SPEC(14,1)= .476034D+03,SPEC(1,16)= .907645D+00,SPEC(1,17)= .737799D+00,
SPEC(1,22)= .122530D+01,SPEC(5,34)= .393174D+02,SPEC(8,13)= .100000D+01,
&END
&D MACH= .20,ALTP= 0.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .413309D+03,SPEC(1,9)= .168711D+01,SPEC(1,8)= .252190D+01,
SPEC(4,7)= .245807D+04,SPEC(9,6)= .588665D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149775D+01,SPEC(1,3)= .931452D+00,SPEC(1,2)= .137745D+01,
SPEC(14,1)= .438527D+03,SPEC(1,16)= .886921D+00,SPEC(1,17)= .684010D+00,
SPEC(1,22)= .117701D+01,SPEC(5,34)= .396313D+02,SPEC(8,13)= .100240D+01,
&END
&D MACH= .30,ALTP= 0.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .406029D+03,SPEC(1,9)= .180130D+01,SPEC(1,8)= .249850D+01,
SPEC(4,7)= .348637D+04,SPEC(9,6)= .307548D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147286D+01,SPEC(1,3)= .549724D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .102543D+01,SPEC(1,17)= .102633D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .118302D+01,
&END
&D MACH= .40,ALTP= 0.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .405972D+03,SPEC(1,9)= .180137D+01,SPEC(1,8)= .249802D+01,
SPEC(4,7)= .352865D+04,SPEC(9,6)= .295193D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147277D+01,SPEC(1,3)= .549834D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .103225D+01,SPEC(1,17)= .103336D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .120656D+01,
&END
&D MACH= .00,ALTP= 689.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .406269D+03,SPEC(1,9)= .180111D+01,SPEC(1,8)= .249923D+01,
SPEC(4,7)= .341865D+04,SPEC(9,6)= .345648D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147309D+01,SPEC(1,3)= .549544D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .101431D+01,SPEC(1,17)= .101488D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .113669D+01,
&END
&D MACH= .20,ALTP= 689.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .406259D+03,SPEC(1,9)= .180120D+01,SPEC(1,8)= .249899D+01,
SPEC(4,7)= .344230D+04,SPEC(9,6)= .325933D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147298D+01,SPEC(1,3)= .549600D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .101825D+01,SPEC(1,17)= .101893D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .116406D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .406275D+03,SPEC(1,9)= .180125D+01,SPEC(1,8)= .249865D+01,
SPEC(4,7)= .347246D+04,SPEC(9,6)= .314594D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147290D+01,SPEC(1,3)= .549706D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .102315D+01,SPEC(1,17)= .102397D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .118291D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .342311D+03,SPEC(1,9)= .183635D+01,SPEC(1,8)= .251146D+01,
SPEC(4,7)= .339548D+04,SPEC(9,6)= .318571D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148531D+01,SPEC(1,3)= .565063D+00,SPEC(1,2)= .133992D+01,

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Listing of "supersonic.input" (Continued)

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SPEC(14,1) = .648246D+03, SPEC(1,16) = .101803D+01, SPEC(1,17) = .102060D+01,
SPEC(1,22) = .107241D+01, SPEC(5,34) = .202872D+02, SPEC(8,13) = .116209D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .269366D+03, SPEC(1,9) = .197166D+01, SPEC(1,8) = .254491D+01,
SPEC(4,7) = .317659D+04, SPEC(9,6) = .330545D-02, SPEC(13,5) = .599105D+01,
SPEC(1,5) = .150757D+01, SPEC(1,3) = .615677D+00, SPEC(1,2) = .134094D+01,
SPEC(14,1) = .644964D+03, SPEC(1,16) = .100289D+01, SPEC(1,17) = .101461D+01,
SPEC(1,22) = .126531D+01, SPEC(5,34) = .204811D+02, SPEC(8,13) = .110213D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .282056D+03, SPEC(1,9) = .201010D+01, SPEC(1,8) = .255850D+01,
SPEC(4,7) = .301931D+04, SPEC(9,6) = .355969D-02, SPEC(13,5) = .599105D+01,
SPEC(1,5) = .151241D+01, SPEC(1,3) = .687449D+00, SPEC(1,2) = .138937D+01,
SPEC(14,1) = .625507D+03, SPEC(1,16) = .984420D+00, SPEC(1,17) = .980382D+00,
SPEC(1,22) = .134322D+01, SPEC(5,34) = .249175D+02, SPEC(8,13) = .106229D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .309663D+03, SPEC(1,9) = .198256D+01, SPEC(1,8) = .256273D+01,
SPEC(4,7) = .289874D+04, SPEC(9,6) = .391748D-02, SPEC(13,5) = .599105D+01,
SPEC(1,5) = .151344D+01, SPEC(1,3) = .759963D+00, SPEC(1,2) = .144581D+01,
SPEC(14,1) = .592803D+03, SPEC(1,16) = .966071D+00, SPEC(1,17) = .927247D+00,
SPEC(1,22) = .134113D+01, SPEC(5,34) = .308882D+02, SPEC(8,13) = .103517D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .325475D+03, SPEC(1,9) = .194154D+01, SPEC(1,8) = .256734D+01,
SPEC(4,7) = .277686D+04, SPEC(9,6) = .428853D-02, SPEC(13,5) = .599105D+01,
SPEC(1,5) = .151414D+01, SPEC(1,3) = .806229D+00, SPEC(1,2) = .144497D+01,
SPEC(14,1) = .555749D+03, SPEC(1,16) = .948325D+00, SPEC(1,17) = .866839D+00,
SPEC(1,22) = .133746D+01, SPEC(5,34) = .335956D+02, SPEC(8,13) = .101689D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .350156D+03, SPEC(1,9) = .183336D+01, SPEC(1,8) = .256063D+01,
SPEC(4,7) = .267169D+04, SPEC(9,6) = .474988D-02, SPEC(13,5) = .599105D+01,
SPEC(1,5) = .151124D+01, SPEC(1,3) = .831823D+00, SPEC(1,2) = .141632D+01,
SPEC(14,1) = .508876D+03, SPEC(1,16) = .929090D+00, SPEC(1,17) = .792822D+00,
SPEC(1,22) = .125947D+01, SPEC(5,34) = .356689D+02, SPEC(8,13) = .100777D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .398091D+03, SPEC(1,9) = .173533D+01, SPEC(1,8) = .253596D+01,
SPEC(4,7) = .257880D+04, SPEC(9,6) = .530426D-02, SPEC(13,5) = .599105D+01,
SPEC(1,5) = .150213D+01, SPEC(1,3) = .886688D+00, SPEC(1,2) = .140582D+01,
SPEC(14,1) = .469351D+03, SPEC(1,16) = .908166D+00, SPEC(1,17) = .730525D+00,
SPEC(1,22) = .118402D+01, SPEC(5,34) = .391665D+02, SPEC(8,13) = .100186D+01,
&END
&D MACH= .30,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .438104D+03, SPEC(1,9) = .165741D+01, SPEC(1,8) = .250539D+01,
SPEC(4,7) = .248292D+04, SPEC(9,6) = .588707D-02, SPEC(13,5) = .599105D+01,
SPEC(1,5) = .149200D+01, SPEC(1,3) = .929476D+00, SPEC(1,2) = .137083D+01,
SPEC(14,1) = .432468D+03, SPEC(1,16) = .887129D+00, SPEC(1,17) = .677484D+00,
SPEC(1,22) = .113809D+01, SPEC(5,34) = .394634D+02, SPEC(8,13) = .100005D+01,
&END
&D MACH= .40,ALTP= 689.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .405940D+03, SPEC(1,9) = .180133D+01, SPEC(1,8) = .249817D+01,
SPEC(4,7) = .351455D+04, SPEC(9,6) = .301953D-02, SPEC(13,5) = .599105D+01,
SPEC(1,5) = .147281D+01, SPEC(1,3) = .549810D+00, SPEC(1,2) = .133689D+01,
SPEC(14,1) = .650000D+03, SPEC(1,16) = .102995D+01, SPEC(1,17) = .103099D+01,
SPEC(1,22) = .102190D+01, SPEC(5,34) = .200000D+02, SPEC(8,13) = .120642D+01,
&END
&D MACH= .00,ALTP= 2000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11) = .406308D+03, SPEC(1,9) = .180104D+01, SPEC(1,8) = .249952D+01,
SPEC(4,7) = .339242D+04, SPEC(9,6) = .360966D-02, SPEC(13,5) = .599105D+01,

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Listing of "supersonic.input" (Continued)

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SPEC(1,5)= .147318D+01,SPEC(1,3)= .549461D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .100998D+01,SPEC(1,17)= .101043D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .113650D+01,
&END
&D MACH= .20,ALTP= 2000.,ETAR= .9650,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .406108D+03,SPEC(1,9)= .180114D+01,SPEC(1,8)= .249928D+01,
SPEC(4,7)= .341585D+04,SPEC(9,6)= .340376D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147307D+01,SPEC(1,3)= .549508D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .101391D+01,SPEC(1,17)= .101446D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .116384D+01,
&END
&D MACH= .30,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .406080D+03,SPEC(1,9)= .180119D+01,SPEC(1,8)= .249894D+01,
SPEC(4,7)= .344578D+04,SPEC(9,6)= .328533D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147299D+01,SPEC(1,3)= .549615D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .101878D+01,SPEC(1,17)= .101949D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .118267D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .406036D+03,SPEC(1,9)= .180126D+01,SPEC(1,8)= .249846D+01,
SPEC(4,7)= .348767D+04,SPEC(9,6)= .315338D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147289D+01,SPEC(1,3)= .549752D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .102556D+01,SPEC(1,17)= .102647D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .120617D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .344938D+03,SPEC(1,9)= .183707D+01,SPEC(1,8)= .251129D+01,
SPEC(4,7)= .341251D+04,SPEC(9,6)= .319706D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148487D+01,SPEC(1,3)= .568394D+00,SPEC(1,2)= .134500D+01,
SPEC(14,1)= .648830D+03,SPEC(1,16)= .102055D+01,SPEC(1,17)= .102400D+01,
SPEC(1,22)= .107175D+01,SPEC(5,34)= .206458D+02,SPEC(8,13)= .118350D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .274352D+03,SPEC(1,9)= .195278D+01,SPEC(1,8)= .254148D+01,
SPEC(4,7)= .319611D+04,SPEC(9,6)= .332891D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150618D+01,SPEC(1,3)= .616179D+00,SPEC(1,2)= .134562D+01,
SPEC(14,1)= .642119D+03,SPEC(1,16)= .100443D+01,SPEC(1,17)= .101189D+01,
SPEC(1,22)= .124288D+01,SPEC(5,34)= .209333D+02,SPEC(8,13)= .112304D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .280613D+03,SPEC(1,9)= .200803D+01,SPEC(1,8)= .255811D+01,
SPEC(4,7)= .303158D+04,SPEC(9,6)= .356555D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151230D+01,SPEC(1,3)= .683995D+00,SPEC(1,2)= .138407D+01,
SPEC(14,1)= .624656D+03,SPEC(1,16)= .986653D+00,SPEC(1,17)= .981575D+00,
SPEC(1,22)= .134252D+01,SPEC(5,34)= .245711D+02,SPEC(8,13)= .107801D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .306468D+03,SPEC(1,9)= .198051D+01,SPEC(1,8)= .256251D+01,
SPEC(4,7)= .290924D+04,SPEC(9,6)= .391992D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151337D+01,SPEC(1,3)= .753037D+00,SPEC(1,2)= .143391D+01,
SPEC(14,1)= .591489D+03,SPEC(1,16)= .968270D+00,SPEC(1,17)= .927678D+00,
SPEC(1,22)= .134186D+01,SPEC(5,34)= .301698D+02,SPEC(8,13)= .104802D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .321771D+03,SPEC(1,9)= .193002D+01,SPEC(1,8)= .256591D+01,
SPEC(4,7)= .278813D+04,SPEC(9,6)= .429614D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151370D+01,SPEC(1,3)= .793515D+00,SPEC(1,2)= .142836D+01,
SPEC(14,1)= .552145D+03,SPEC(1,16)= .950268D+00,SPEC(1,17)= .864465D+00,
SPEC(1,22)= .132832D+01,SPEC(5,34)= .325362D+02,SPEC(8,13)= .102744D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .354482D+03,SPEC(1,9)= .180937D+01,SPEC(1,8)= .255436D+01,

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Listing of "supersonic.input" (Continued)

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SPEC(4,7)= .268880D+04,SPEC(9,6)= .478522D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150929D+01,SPEC(1,3)= .821067D+00,SPEC(1,2)= .140201D+01,
SPEC(14,1)= .503336D+03,SPEC(1,16)= .930376D+00,SPEC(1,17)= .787426D+00,
SPEC(1,22)= .123272D+01,SPEC(5,34)= .349648D+02,SPEC(8,13)= .101632D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .410211D+03,SPEC(1,9)= .171576D+01,SPEC(1,8)= .252739D+01,
SPEC(4,7)= .259767D+04,SPEC(9,6)= .535388D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149917D+01,SPEC(1,3)= .882989D+00,SPEC(1,2)= .139958D+01,
SPEC(14,1)= .465174D+03,SPEC(1,16)= .909167D+00,SPEC(1,17)= .726593D+00,
SPEC(1,22)= .115988D+01,SPEC(5,34)= .390236D+02,SPEC(8,13)= .100688D+01,
&END
&D MACH= .40,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .454192D+03,SPEC(1,9)= .163810D+01,SPEC(1,8)= .249273D+01,
SPEC(4,7)= .250194D+04,SPEC(9,6)= .594720D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148775D+01,SPEC(1,3)= .921324D+00,SPEC(1,2)= .136026D+01,
SPEC(14,1)= .427282D+03,SPEC(1,16)= .887610D+00,SPEC(1,17)= .673374D+00,
SPEC(1,22)= .111474D+01,SPEC(5,34)= .385548D+02,SPEC(8,13)= .100153D+01,
&END
&D MACH= .60,ALTP= 2000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .405975D+03,SPEC(1,9)= .180145D+01,SPEC(1,8)= .249847D+01,
SPEC(4,7)= .349657D+04,SPEC(9,6)= .276424D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147274D+01,SPEC(1,3)= .549672D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .102733D+01,SPEC(1,17)= .102826D+01,
SPEC(1,22)= .102190D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .127682D+01,
SPEC(5,13)=0.981,SPEC(12,1)=0,
&END
&D MACH= .40,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .367248D+03,SPEC(1,9)= .181929D+01,SPEC(1,8)= .250841D+01,
SPEC(4,7)= .318158D+04,SPEC(9,6)= .408499D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148025D+01,SPEC(1,3)= .554700D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .978919D+00,SPEC(1,17)= .980374D+00,
SPEC(1,22)= .104740D+01,SPEC(8,13)= .119384D+01,SPEC(5,34)= .200000D+02,
SPEC(5,13)=0.950,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .367181D+03,SPEC(1,9)= .181959D+01,SPEC(1,8)= .250711D+01,
SPEC(4,7)= .329152D+04,SPEC(9,6)= .364468D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147991D+01,SPEC(1,3)= .555080D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .997281D+00,SPEC(1,17)= .999214D+00,
SPEC(1,22)= .104740D+01,SPEC(8,13)= .126359D+01,SPEC(5,34)= .200000D+02,
SPEC(5,13)=0.981,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .321116D+03,SPEC(1,9)= .185764D+01,SPEC(1,8)= .251952D+01,
SPEC(4,7)= .321914D+04,SPEC(9,6)= .369243D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149084D+01,SPEC(1,3)= .572492D+00,SPEC(1,2)= .134181D+01,
SPEC(14,1)= .648778D+03,SPEC(1,16)= .992326D+00,SPEC(1,17)= .996823D+00,
SPEC(1,22)= .110096D+01,SPEC(5,34)= .204102D+02,SPEC(8,13)= .123816D+01,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .269738D+03,SPEC(1,9)= .196341D+01,SPEC(1,8)= .254657D+01,
SPEC(4,7)= .301690D+04,SPEC(9,6)= .385479D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150814D+01,SPEC(1,3)= .617108D+00,SPEC(1,2)= .133736D+01,
SPEC(14,1)= .639085D+03,SPEC(1,16)= .975811D+00,SPEC(1,17)= .980293D+00,
SPEC(1,22)= .126465D+01,SPEC(5,34)= .204446D+02,SPEC(8,13)= .117214D+01,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .282407D+03,SPEC(1,9)= .200223D+01,SPEC(1,8)= .256061D+01,
SPEC(4,7)= .286980D+04,SPEC(9,6)= .415764D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151281D+01,SPEC(1,3)= .688997D+00,SPEC(1,2)= .138478D+01,
SPEC(14,1)= .618874D+03,SPEC(1,16)= .958243D+00,SPEC(1,17)= .946597D+00,

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Listing of "supersonic.input" (Continued)

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SPEC(1,22)= .134253D+01,SPEC(5,34)= .249350D+02,SPEC(8,13)= .112120D+01,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .307317D+03,SPEC(1,9)= .197404D+01,SPEC(1,8)= .256527D+01,
SPEC(4,7)= .275349D+04,SPEC(9,6)= .457068D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151372D+01,SPEC(1,3)= .756180D+00,SPEC(1,2)= .142915D+01,
SPEC(14,1)= .585344D+03,SPEC(1,16)= .940372D+00,SPEC(1,17)= .893540D+00,
SPEC(1,22)= .134239D+01,SPEC(5,34)= .302700D+02,SPEC(8,13)= .108490D+01,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .326760D+03,SPEC(1,9)= .187463D+01,SPEC(1,8)= .256252D+01,
SPEC(4,7)= .264677D+04,SPEC(9,6)= .505230D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151206D+01,SPEC(1,3)= .777613D+00,SPEC(1,2)= .140459D+01,
SPEC(14,1)= .536003D+03,SPEC(1,16)= .921616D+00,SPEC(1,17)= .818473D+00,
SPEC(1,22)= .127510D+01,SPEC(5,34)= .320768D+02,SPEC(8,13)= .106351D+01,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .369637D+03,SPEC(1,9)= .177632D+01,SPEC(1,8)= .254734D+01,
SPEC(4,7)= .255439D+04,SPEC(9,6)= .563708D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150611D+01,SPEC(1,3)= .826831D+00,SPEC(1,2)= .139743D+01,
SPEC(14,1)= .493709D+03,SPEC(1,16)= .902011D+00,SPEC(1,17)= .751786D+00,
SPEC(1,22)= .119902D+01,SPEC(5,34)= .356018D+02,SPEC(8,13)= .104460D+01,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .408971D+03,SPEC(1,9)= .171141D+01,SPEC(1,8)= .252866D+01,
SPEC(4,7)= .245645D+04,SPEC(9,6)= .623945D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149862D+01,SPEC(1,3)= .886640D+00,SPEC(1,2)= .139234D+01,
SPEC(14,1)= .460641D+03,SPEC(1,16)= .882417D+00,SPEC(1,17)= .701372D+00,
SPEC(1,22)= .116438D+01,SPEC(5,34)= .387870D+02,SPEC(8,13)= .102743D+01,
&END
&D MACH= .60,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .470017D+03,SPEC(1,9)= .162270D+01,SPEC(1,8)= .248466D+01,
SPEC(4,7)= .237295D+04,SPEC(9,6)= .698394D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148451D+01,SPEC(1,3)= .933104D+00,SPEC(1,2)= .135692D+01,
SPEC(14,1)= .421672D+03,SPEC(1,16)= .860227D+00,SPEC(1,17)= .647503D+00,
SPEC(1,22)= .110318D+01,SPEC(5,34)= .387488D+02,SPEC(8,13)= .101609D+01,
&END
&D MACH= .90,ALTP= 10000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .367075D+03,SPEC(1,9)= .182002D+01,SPEC(1,8)= .250426D+01,
SPEC(4,7)= .353536D+04,SPEC(9,6)= .286148D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147923D+01,SPEC(1,3)= .555866D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .103712D+01,SPEC(1,17)= .104033D+01,
SPEC(1,22)= .104740D+01,SPEC(8,13)= .148711D+01,SPEC(5,34)= .200000D+02,
SPEC(6,13)=3,
&END
&D MACH= .40,ALTP= 15000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .367394D+03,SPEC(1,9)= .181872D+01,SPEC(1,8)= .250954D+01,
SPEC(4,7)= .307811D+04,SPEC(9,6)= .488390D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148060D+01,SPEC(1,3)= .554553D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .961003D+00,SPEC(1,17)= .962135D+00,
SPEC(1,22)= .104740D+01,SPEC(8,13)= .119296D+01,SPEC(5,34)= .200000D+02,
SPEC(5,13)=0.950,SPEC(6,13)=1,
&END
&D MACH= .60,ALTP= 15000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .367378D+03,SPEC(1,9)= .181916D+01,SPEC(1,8)= .250829D+01,
SPEC(4,7)= .318443D+04,SPEC(9,6)= .435775D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148032D+01,SPEC(1,3)= .554801D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .979149D+00,SPEC(1,17)= .980631D+00,
SPEC(1,22)= .104740D+01,SPEC(8,13)= .126242D+01,SPEC(5,34)= .200000D+02,
SPEC(5,13)=0.981,
&END
&D MACH= .90,ALTP= 15000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,

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Listing of "supersonic.input" (Continued)

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SPEC(2,11)= .406183D+03,SPEC(1,9)= .180109D+01,SPEC(1,8)= .249876D+01,
SPEC(4,7)= .345566D+04,SPEC(9,6)= .340854D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147305D+01,SPEC(1,3)= .549683D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .102024D+01,SPEC(1,17)= .102100D+01,
SPEC(1,22)= .102184D+01,SPEC(8,13)= .149801D+01,SPEC(5,34)= .200000D+02,
SPEC(6,13)=3,
&END
&D MACH= .40,ALTP= 20000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .372230D+03,SPEC(1,9)= .181537D+01,SPEC(1,8)= .250968D+01,
SPEC(4,7)= .297914D+04,SPEC(9,6)= .587709D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147994D+01,SPEC(1,3)= .553882D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .942813D+00,SPEC(1,17)= .943552D+00,
SPEC(1,22)= .104387D+01,SPEC(8,13)= .119356D+01,SPEC(5,34)= .200000D+02,
SPEC(5,13)=0.950,SPEC(6,13)=1,
&END
&D MACH= .60,ALTP= 20000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .371998D+03,SPEC(1,9)= .181597D+01,SPEC(1,8)= .250854D+01,
SPEC(4,7)= .308148D+04,SPEC(9,6)= .524331D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147985D+01,SPEC(1,3)= .553845D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .960773D+00,SPEC(1,17)= .961696D+00,
SPEC(1,22)= .104387D+01,SPEC(8,13)= .126301D+01,SPEC(5,34)= .200000D+02,
SPEC(5,13)=0.981,
&END
&D MACH= .90,ALTP= 20000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .406410D+03,SPEC(1,9)= .180074D+01,SPEC(1,8)= .250002D+01,
SPEC(4,7)= .333984D+04,SPEC(9,6)= .410391D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147340D+01,SPEC(1,3)= .549367D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .100110D+01,SPEC(1,17)= .100130D+01,
SPEC(1,22)= .102184D+01,SPEC(8,13)= .149885D+01,SPEC(5,34)= .200000D+02,
SPEC(6,13)=3,
&END
&D MACH= 1.10,ALTP= 20000.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .350988D+03,SPEC(1,9)= .183356D+01,SPEC(1,8)= .250807D+01,
SPEC(4,7)= .350480D+04,SPEC(9,6)= .337753D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148163D+01,SPEC(1,3)= .558212D+00,SPEC(1,2)= .133819D+01,
SPEC(14,1)= .653000D+03,SPEC(1,16)= .103329D+01,SPEC(1,17)= .104096D+01,
SPEC(1,22)= .106136D+01,SPEC(8,13)= .184830D+01,SPEC(5,34)= .200000D+02,
/* SPEC(4,12)=2235, */
&END
/* &D SPEC(4,12)=0, &END */
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .372298D+03,SPEC(1,9)= .181553D+01,SPEC(1,8)= .250829D+01,
SPEC(4,7)= .307985D+04,SPEC(9,6)= .610658D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148011D+01,SPEC(1,3)= .554183D+00,SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .959711D+00,SPEC(1,17)= .960701D+00,
SPEC(1,22)= .104387D+01,SPEC(8,13)= .147994D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .323826D+03,SPEC(1,9)= .185059D+01,SPEC(1,8)= .252034D+01,
SPEC(4,7)= .301003D+04,SPEC(9,6)= .618217D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149120D+01,SPEC(1,3)= .567676D+00,SPEC(1,2)= .133576D+01,
SPEC(14,1)= .647624D+03,SPEC(1,16)= .954584D+00,SPEC(1,17)= .956622D+00,
SPEC(1,22)= .109606D+01,SPEC(5,34)= .200000D+02,SPEC(8,13)= .142475D+01,
&END
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .270628D+03,SPEC(1,9)= .195753D+01,SPEC(1,8)= .254804D+01,
SPEC(4,7)= .282089D+04,SPEC(9,6)= .646109D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150838D+01,SPEC(1,3)= .614674D+00,SPEC(1,2)= .133430D+01,
SPEC(14,1)= .638244D+03,SPEC(1,16)= .938623D+00,SPEC(1,17)= .941328D+00,
SPEC(1,22)= .126032D+01,SPEC(5,34)= .202516D+02,SPEC(8,13)= .135292D+01,
&END
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,

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Listing of "supersonic.input" (Continued)

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SPEC(2,11)= .287687D+03,SPEC(1,9)= .198416D+01,SPEC(1,8)= .256014D+01,
SPEC(4,7)= .268927D+04,SPEC(9,6)= .701062D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151209D+01,SPEC(1,3)= .692208D+00,SPEC(1,2)= .139189D+01,
SPEC(14,1)= .616462D+03,SPEC(1,16)= .921162D+00,SPEC(1,17)= .906320D+00,
SPEC(1,22)= .132098D+01,SPEC(5,34)= .256034D+02,SPEC(8,13)= .127524D+01,
&END
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .315657D+03,SPEC(1,9)= .194758D+01,SPEC(1,8)= .256387D+01,
SPEC(4,7)= .258345D+04,SPEC(9,6)= .773321D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151250D+01,SPEC(1,3)= .760852D+00,SPEC(1,2)= .143852D+01,
SPEC(14,1)= .581541D+03,SPEC(1,16)= .903583D+00,SPEC(1,17)= .852998D+00,
SPEC(1,22)= .131048D+01,SPEC(5,34)= .312209D+02,SPEC(8,13)= .122173D+01,
&END
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .321004D+03,SPEC(1,9)= .192003D+01,SPEC(1,8)= .257105D+01,
SPEC(4,7)= .246580D+04,SPEC(9,6)= .840553D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151345D+01,SPEC(1,3)= .795351D+00,SPEC(1,2)= .141908D+01,
SPEC(14,1)= .545498D+03,SPEC(1,16)= .886906D+00,SPEC(1,17)= .799844D+00,
SPEC(1,22)= .133025D+01,SPEC(5,34)= .323824D+02,SPEC(8,13)= .117765D+01,
&END
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .355968D+03,SPEC(1,9)= .180661D+01,SPEC(1,8)= .255965D+01,
SPEC(4,7)= .237871D+04,SPEC(9,6)= .937460D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150875D+01,SPEC(1,3)= .834127D+00,SPEC(1,2)= .140299D+01,
SPEC(14,1)= .499674D+03,SPEC(1,16)= .868063D+00,SPEC(1,17)= .731179D+00,
SPEC(1,22)= .124118D+01,SPEC(5,34)= .354552D+02,SPEC(8,13)= .115049D+01,
&END
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .404919D+03,SPEC(1,9)= .171970D+01,SPEC(1,8)= .253467D+01,
SPEC(4,7)= .229566D+04,SPEC(9,6)= .104702D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149938D+01,SPEC(1,3)= .898943D+00,SPEC(1,2)= .140146D+01,
SPEC(14,1)= .463203D+03,SPEC(1,16)= .848216D+00,SPEC(1,17)= .676786D+00,
SPEC(1,22)= .117806D+01,SPEC(5,34)= .394725D+02,SPEC(8,13)= .112405D+01,
&END
&D MACH= .90,ALTP= 30000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .447645D+03,SPEC(1,9)= .163912D+01,SPEC(1,8)= .249899D+01,
SPEC(4,7)= .221237D+04,SPEC(9,6)= .116571D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148857D+01,SPEC(1,3)= .941851D+00,SPEC(1,2)= .136283D+01,
SPEC(14,1)= .425435D+03,SPEC(1,16)= .827627D+00,SPEC(1,17)= .626784D+00,
SPEC(1,22)= .113016D+01,SPEC(5,34)= .391850D+02,SPEC(8,13)= .110017D+01,
&END
&D MACH= 1.10,ALTP= 30000.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .371478D+03,SPEC(1,9)= .181992D+01,SPEC(1,8)= .250641D+01,
SPEC(4,7)= .328246D+04,SPEC(9,6)= .499674D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147853D+01,SPEC(1,3)= .553523D+00,SPEC(1,2)= .133819D+01,
SPEC(14,1)= .653000D+03,SPEC(1,16)= .993719D+00,SPEC(1,17)= .998785D+00,
SPEC(1,22)= .104387D+01,SPEC(8,13)= .185185D+01,SPEC(5,34)= .200000D+02,
/* SPEC(4,12)=2120, */
&END
/* &D SPEC(4,12)=0, &END */
&D MACH= 1.40,ALTP= 30000.,ETAR= .9348,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .373995D+03,SPEC(1,9)= .180328D+01,SPEC(1,8)= .250141D+01,
SPEC(4,7)= .354927D+04,SPEC(9,6)= .377404D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148204D+01,SPEC(1,3)= .559785D+00,SPEC(1,2)= .133024D+01,
SPEC(14,1)= .637000D+03,SPEC(1,16)= .103967D+01,SPEC(1,17)= .102843D+01,
SPEC(1,22)= .104387D+01,SPEC(8,13)= .227334D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.50,ALTP= 30000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .407504D+03,SPEC(1,9)= .177797D+01,SPEC(1,8)= .249384D+01,
SPEC(4,7)= .365879D+04,SPEC(9,6)= .357336D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147967D+01,SPEC(1,3)= .558119D+00,SPEC(1,2)= .132442D+01,
SPEC(14,1)= .625000D+03,SPEC(1,16)= .105547D+01,SPEC(1,17)= .103013D+01,

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Listing of "supersonic.input" (Continued)

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SPEC(1,22)= .102300D+01,SPEC(8,13)= .241798D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.53,ALTP= 30000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .408935D+03,SPEC(1,9)= .177495D+01,SPEC(1,8)= .249345D+01,
SPEC(4,7)= .368289D+04,SPEC(9,6)= .330733D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148024D+01,SPEC(1,3)= .558839D+00,SPEC(1,2)= .132278D+01,
SPEC(14,1)= .621000D+03,SPEC(1,16)= .105998D+01,SPEC(1,17)= .103037D+01,
SPEC(1,22)= .102300D+01,SPEC(8,13)= .253130D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.60,ALTP= 30000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .409479D+03,SPEC(1,9)= .176891D+01,SPEC(1,8)= .249243D+01,
SPEC(4,7)= .374827D+04,SPEC(9,6)= .307089D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148133D+01,SPEC(1,3)= .560312D+00,SPEC(1,2)= .131973D+01,
SPEC(14,1)= .613000D+03,SPEC(1,16)= .107143D+01,SPEC(1,17)= .103317D+01,
SPEC(1,22)= .102300D+01,SPEC(8,13)= .267929D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= .90,ALTP= 36089.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .395556D+03,SPEC(1,9)= .180307D+01,SPEC(1,8)= .250552D+01,
SPEC(4,7)= .295797D+04,SPEC(9,6)= .787986D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147651D+01,SPEC(1,3)= .551122D+00,SPEC(1,2)= .133687D+01,
SPEC(14,1)= .650000D+03,SPEC(1,16)= .935276D+00,SPEC(1,17)= .935108D+00,
SPEC(1,22)= .102863D+01,SPEC(8,13)= .148637D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .394250D+03,SPEC(1,9)= .180792D+01,SPEC(1,8)= .250393D+01,
SPEC(4,7)= .315093D+04,SPEC(9,6)= .644590D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147505D+01,SPEC(1,3)= .549748D+00,SPEC(1,2)= .133819D+01,
SPEC(14,1)= .653000D+03,SPEC(1,16)= .968780D+00,SPEC(1,17)= .972211D+00,
SPEC(1,22)= .102863D+01,SPEC(8,13)= .186075D+01,SPEC(5,34)= .200000D+02,
/* SPEC(4,12)=2050, */
&END
/* &D SPEC(4,12)=0, &END */
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .348820D+03,SPEC(1,9)= .183397D+01,SPEC(1,8)= .251398D+01,
SPEC(4,7)= .308470D+04,SPEC(9,6)= .655212D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148551D+01,SPEC(1,3)= .567643D+00,SPEC(1,2)= .134644D+01,
SPEC(14,1)= .649839D+03,SPEC(1,16)= .963229D+00,SPEC(1,17)= .966233D+00,
SPEC(1,22)= .106844D+01,SPEC(5,34)= .207213D+02,SPEC(8,13)= .182670D+01,
&END
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .266586D+03,SPEC(1,9)= .199084D+01,SPEC(1,8)= .255143D+01,
SPEC(4,7)= .287909D+04,SPEC(9,6)= .677086D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150975D+01,SPEC(1,3)= .618970D+00,SPEC(1,2)= .134285D+01,
SPEC(14,1)= .649438D+03,SPEC(1,16)= .949437D+00,SPEC(1,17)= .965641D+00,
SPEC(1,22)= .128675D+01,SPEC(5,34)= .204655D+02,SPEC(8,13)= .166597D+01,
&END
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .300575D+03,SPEC(1,9)= .198718D+01,SPEC(1,8)= .255745D+01,
SPEC(4,7)= .275674D+04,SPEC(9,6)= .742955D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151161D+01,SPEC(1,3)= .711878D+00,SPEC(1,2)= .143556D+01,
SPEC(14,1)= .625822D+03,SPEC(1,16)= .930299D+00,SPEC(1,17)= .925430D+00,
SPEC(1,22)= .130429D+01,SPEC(5,34)= .281373D+02,SPEC(8,13)= .158116D+01,
&END
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .327124D+03,SPEC(1,9)= .194716D+01,SPEC(1,8)= .256054D+01,
SPEC(4,7)= .264585D+04,SPEC(9,6)= .818297D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151197D+01,SPEC(1,3)= .775778D+00,SPEC(1,2)= .147936D+01,
SPEC(14,1)= .589412D+03,SPEC(1,16)= .912123D+00,SPEC(1,17)= .869460D+00,
SPEC(1,22)= .129281D+01,SPEC(5,34)= .333702D+02,SPEC(8,13)= .151187D+01,
&END
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .345993D+03,SPEC(1,9)= .190842D+01,SPEC(1,8)= .256619D+01,

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Listing of "supersonic.input" (Continued)

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SPEC(4,7)= .253521D+04, SPEC(9,6)= .897063D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151282D+01, SPEC(1,3)= .828520D+00, SPEC(1,2)= .148232D+01,
SPEC(14,1)= .553631D+03, SPEC(1,16)= .895128D+00, SPEC(1,17)= .812916D+00,
SPEC(1,22)= .129074D+01, SPEC(5,34)= .366807D+02, SPEC(8,13)= .145106D+01,
&END
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .355301D+03, SPEC(1,9)= .187526D+01, SPEC(1,8)= .257227D+01,
SPEC(4,7)= .242128D+04, SPEC(9,6)= .976388D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151331D+01, SPEC(1,3)= .871572D+00, SPEC(1,2)= .146510D+01,
SPEC(14,1)= .520651D+03, SPEC(1,16)= .878510D+00, SPEC(1,17)= .762186D+00,
SPEC(1,22)= .130410D+01, SPEC(5,34)= .386790D+02, SPEC(8,13)= .139703D+01,
&END
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .365163D+03, SPEC(1,9)= .180963D+01, SPEC(1,8)= .256671D+01,
SPEC(4,7)= .231543D+04, SPEC(9,6)= .106743D-01, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151039D+01, SPEC(1,3)= .900005D+00, SPEC(1,2)= .141940D+01,
SPEC(14,1)= .483455D+03, SPEC(1,16)= .860507D+00, SPEC(1,17)= .709033D+00,
SPEC(1,22)= .128429D+01, SPEC(5,34)= .388528D+02, SPEC(8,13)= .135856D+01,
&END
&D MACH= 1.10,ALTP= 36089.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .369080D+03, SPEC(1,9)= .176210D+01, SPEC(1,8)= .255752D+01,
SPEC(4,7)= .221247D+04, SPEC(9,6)= .116403D-01, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150835D+01, SPEC(1,3)= .932993D+00, SPEC(1,2)= .137995D+01,
SPEC(14,1)= .451031D+03, SPEC(1,16)= .842608D+00, SPEC(1,17)= .666213D+00,
SPEC(1,22)= .128720D+01, SPEC(5,34)= .384435D+02, SPEC(8,13)= .131804D+01,
&END
&D MACH= 1.40,ALTP= 36089.,ETAR= .9348,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .397201D+03, SPEC(1,9)= .179178D+01, SPEC(1,8)= .249893D+01,
SPEC(4,7)= .340790D+04, SPEC(9,6)= .486952D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147922D+01, SPEC(1,3)= .556036D+00, SPEC(1,2)= .133024D+01,
SPEC(14,1)= .637000D+03, SPEC(1,16)= .101385D+01, SPEC(1,17)= .100110D+01,
SPEC(1,22)= .102863D+01, SPEC(8,13)= .228372D+01, SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.50,ALTP= 36089.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .399732D+03, SPEC(1,9)= .178128D+01, SPEC(1,8)= .249703D+01,
SPEC(4,7)= .348551D+04, SPEC(9,6)= .462516D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148134D+01, SPEC(1,3)= .559566D+00, SPEC(1,2)= .132443D+01,
SPEC(14,1)= .625000D+03, SPEC(1,16)= .102778D+01, SPEC(1,17)= .100278D+01,
SPEC(1,22)= .102863D+01, SPEC(8,13)= .240129D+01, SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.53,ALTP= 36089.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .400109D+03, SPEC(1,9)= .177825D+01, SPEC(1,8)= .249666D+01,
SPEC(4,7)= .350845D+04, SPEC(9,6)= .428084D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148190D+01, SPEC(1,3)= .560401D+00, SPEC(1,2)= .132278D+01,
SPEC(14,1)= .621000D+03, SPEC(1,16)= .103218D+01, SPEC(1,17)= .100302D+01,
SPEC(1,22)= .102863D+01, SPEC(8,13)= .251445D+01, SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.60,ALTP= 36089.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .400410D+03, SPEC(1,9)= .177211D+01, SPEC(1,8)= .249561D+01,
SPEC(4,7)= .357122D+04, SPEC(9,6)= .397465D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148279D+01, SPEC(1,3)= .562096D+00, SPEC(1,2)= .131973D+01,
SPEC(14,1)= .613000D+03, SPEC(1,16)= .104333D+01, SPEC(1,17)= .100576D+01,
SPEC(1,22)= .102863D+01, SPEC(8,13)= .265775D+01, SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.80,ALTP= 36089.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .385930D+03, SPEC(1,9)= .176167D+01, SPEC(1,8)= .249553D+01,
SPEC(4,7)= .374806D+04, SPEC(9,6)= .320539D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148668D+01, SPEC(1,3)= .569271D+00, SPEC(1,2)= .131091D+01,
SPEC(14,1)= .590000D+03, SPEC(1,16)= .107636D+01, SPEC(1,17)= .101402D+01,
SPEC(1,22)= .103881D+01, SPEC(8,13)= .319822D+01, SPEC(5,34)= .200000D+02,
&END
&D MACH= .90,ALTP= 40000.,ETAR= .9706,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,

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Listing of "supersonic.input" (Continued)

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SPEC(2,11)= .396428D+03, SPEC(1,9)= .180225D+01, SPEC(1,8)= .250488D+01,
SPEC(4,7)= .296412D+04, SPEC(9,6)= .950482D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147691D+01, SPEC(1,3)= .551764D+00, SPEC(1,2)= .133689D+01,
SPEC(14,1)= .650000D+03, SPEC(1,16)= .934824D+00, SPEC(1,17)= .934861D+00,
SPEC(1,22)= .102863D+01, SPEC(8,13)= .148542D+01, SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.10,ALTP= 40000.,ETAR= .9664,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .394500D+03, SPEC(1,9)= .180719D+01, SPEC(1,8)= .250344D+01,
SPEC(4,7)= .315591D+04, SPEC(9,6)= .777408D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147543D+01, SPEC(1,3)= .550260D+00, SPEC(1,2)= .133819D+01,
SPEC(14,1)= .653000D+03, SPEC(1,16)= .968389D+00, SPEC(1,17)= .971933D+00,
SPEC(1,22)= .102863D+01, SPEC(8,13)= .186116D+01, SPEC(5,34)= .200000D+02,
/* SPEC(4,12)=2050, */
&END
/* &D SPEC(4,12)=0, &END */
&D MACH= 1.40,ALTP= 40000.,ETAR= .9348,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .397322D+03, SPEC(1,9)= .179131D+01, SPEC(1,8)= .249858D+01,
SPEC(4,7)= .341114D+04, SPEC(9,6)= .587213D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147956D+01, SPEC(1,3)= .556356D+00, SPEC(1,2)= .133024D+01,
SPEC(14,1)= .637000D+03, SPEC(1,16)= .101346D+01, SPEC(1,17)= .100081D+01,
SPEC(1,22)= .102863D+01, SPEC(8,13)= .228183D+01, SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .399200D+03, SPEC(1,9)= .178084D+01, SPEC(1,8)= .249669D+01,
SPEC(4,7)= .348856D+04, SPEC(9,6)= .557735D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148163D+01, SPEC(1,3)= .559875D+00, SPEC(1,2)= .132443D+01,
SPEC(14,1)= .625000D+03, SPEC(1,16)= .102740D+01, SPEC(1,17)= .100250D+01,
SPEC(1,22)= .102863D+01, SPEC(8,13)= .240077D+01, SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .342669D+03, SPEC(1,9)= .181811D+01, SPEC(1,8)= .251069D+01,
SPEC(4,7)= .341538D+04, SPEC(9,6)= .565832D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149090D+01, SPEC(1,3)= .582301D+00, SPEC(1,2)= .133745D+01,
SPEC(14,1)= .624910D+03, SPEC(1,16)= .102280D+01, SPEC(1,17)= .100145D+01,
SPEC(1,22)= .108006D+01, SPEC(5,34)= .210000D+02, SPEC(8,13)= .233418D+01,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .308784D+03, SPEC(1,9)= .191884D+01, SPEC(1,8)= .253844D+01,
SPEC(4,7)= .323412D+04, SPEC(9,6)= .602119D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150581D+01, SPEC(1,3)= .674650D+00, SPEC(1,2)= .140847D+01,
SPEC(14,1)= .621522D+03, SPEC(1,16)= .100776D+01, SPEC(1,17)= .993090D+00,
SPEC(1,22)= .121600D+01, SPEC(5,34)= .265112D+02, SPEC(8,13)= .213759D+01,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .310746D+03, SPEC(1,9)= .197869D+01, SPEC(1,8)= .255598D+01,
SPEC(4,7)= .307457D+04, SPEC(9,6)= .646736D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151222D+01, SPEC(1,3)= .749778D+00, SPEC(1,2)= .145481D+01,
SPEC(14,1)= .604608D+03, SPEC(1,16)= .991139D+00, SPEC(1,17)= .964920D+00,
SPEC(1,22)= .131906D+01, SPEC(5,34)= .306515D+02, SPEC(8,13)= .198765D+01,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .335284D+03, SPEC(1,9)= .192898D+01, SPEC(1,8)= .255893D+01,
SPEC(4,7)= .295363D+04, SPEC(9,6)= .712272D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151282D+01, SPEC(1,3)= .806285D+00, SPEC(1,2)= .147306D+01,
SPEC(14,1)= .566715D+03, SPEC(1,16)= .972610D+00, SPEC(1,17)= .900795D+00,
SPEC(1,22)= .129956D+01, SPEC(5,34)= .348652D+02, SPEC(8,13)= .190595D+01,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .340963D+03, SPEC(1,9)= .189940D+01, SPEC(1,8)= .256594D+01,
SPEC(4,7)= .282030D+04, SPEC(9,6)= .773536D-02, SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151405D+01, SPEC(1,3)= .841839D+00, SPEC(1,2)= .145003D+01,
SPEC(14,1)= .532093D+03, SPEC(1,16)= .955022D+00, SPEC(1,17)= .844220D+00,

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Listing of "supersonic.input" (Continued)

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SPEC(1,22)= .131787D+01,SPEC(5,34)= .364191D+02,SPEC(8,13)= .183003D+01,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .358188D+03,SPEC(1,9)= .184154D+01,SPEC(1,8)= .256569D+01,
SPEC(4,7)= .270269D+04,SPEC(9,6)= .847541D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151302D+01,SPEC(1,3)= .887056D+00,SPEC(1,2)= .143297D+01,
SPEC(14,1)= .497556D+03,SPEC(1,16)= .936698D+00,SPEC(1,17)= .787265D+00,
SPEC(1,22)= .129994D+01,SPEC(5,34)= .384293D+02,SPEC(8,13)= .176839D+01,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .362891D+03,SPEC(1,9)= .179197D+01,SPEC(1,8)= .255947D+01,
SPEC(4,7)= .258216D+04,SPEC(9,6)= .922673D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151119D+01,SPEC(1,3)= .917604D+00,SPEC(1,2)= .139300D+01,
SPEC(14,1)= .464441D+03,SPEC(1,16)= .917829D+00,SPEC(1,17)= .739170D+00,
SPEC(1,22)= .129982D+01,SPEC(5,34)= .383943D+02,SPEC(8,13)= .171758D+01,
&END
&D MACH= 1.50,ALTP= 40000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .373665D+03,SPEC(1,9)= .174018D+01,SPEC(1,8)= .254627D+01,
SPEC(4,7)= .247476D+04,SPEC(9,6)= .101083D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150981D+01,SPEC(1,3)= .962331D+00,SPEC(1,2)= .136587D+01,
SPEC(14,1)= .433823D+03,SPEC(1,16)= .898702D+00,SPEC(1,17)= .694457D+00,
SPEC(1,22)= .129269D+01,SPEC(5,34)= .385788D+02,SPEC(8,13)= .169245D+01,
&END
&D MACH= 1.53,ALTP= 40000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .399817D+03,SPEC(1,9)= .177783D+01,SPEC(1,8)= .249634D+01,
SPEC(4,7)= .351115D+04,SPEC(9,6)= .516203D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148208D+01,SPEC(1,3)= .560675D+00,SPEC(1,2)= .132278D+01,
SPEC(14,1)= .621000D+03,SPEC(1,16)= .103181D+01,SPEC(1,17)= .100273D+01,
SPEC(1,22)= .102863D+01,SPEC(8,13)= .251413D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.60,ALTP= 40000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .398146D+03,SPEC(1,9)= .177184D+01,SPEC(1,8)= .249536D+01,
SPEC(4,7)= .357340D+04,SPEC(9,6)= .479295D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148308D+01,SPEC(1,3)= .562403D+00,SPEC(1,2)= .131973D+01,
SPEC(14,1)= .613000D+03,SPEC(1,16)= .104296D+01,SPEC(1,17)= .100547D+01,
SPEC(1,22)= .102880D+01,SPEC(8,13)= .266057D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.80,ALTP= 40000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .381013D+03,SPEC(1,9)= .176374D+01,SPEC(1,8)= .249630D+01,
SPEC(4,7)= .374464D+04,SPEC(9,6)= .386700D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148733D+01,SPEC(1,3)= .570276D+00,SPEC(1,2)= .131092D+01,
SPEC(14,1)= .590000D+03,SPEC(1,16)= .107576D+01,SPEC(1,17)= .101374D+01,
SPEC(1,22)= .104230D+01,SPEC(8,13)= .311973D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.10,ALTP= 40000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .290099D+03,SPEC(1,9)= .180255D+01,SPEC(1,8)= .252711D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .301961D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150332D+01,SPEC(1,3)= .627412D+00,SPEC(1,2)= .127920D+01,
SPEC(14,1)= .526000D+03,SPEC(1,16)= .110584D+01,SPEC(1,17)= .979775D+00,
SPEC(1,22)= .118491D+01,SPEC(8,13)= .350401D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.40,ALTP= 50000.,ETAR= .9348,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .397090D+03,SPEC(1,9)= .178998D+01,SPEC(1,8)= .249733D+01,
SPEC(4,7)= .342876D+04,SPEC(9,6)= .948457D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148066D+01,SPEC(1,3)= .557734D+00,SPEC(1,2)= .133024D+01,
SPEC(14,1)= .637000D+03,SPEC(1,16)= .101306D+01,SPEC(1,17)= .100081D+01,
SPEC(1,22)= .102920D+01,SPEC(8,13)= .228360D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.50,ALTP= 50000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .399035D+03,SPEC(1,9)= .177964D+01,SPEC(1,8)= .249551D+01,
SPEC(4,7)= .350538D+04,SPEC(9,6)= .900793D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148262D+01,SPEC(1,3)= .561159D+00,SPEC(1,2)= .132443D+01,

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Listing of "supersonic.input" (Continued)

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SPEC(14,1)= .625000D+03,SPEC(1,16)= .102702D+01,SPEC(1,17)= .100250D+01,
SPEC(1,22)= .102920D+01,SPEC(8,13)= .240127D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.53,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .397564D+03,SPEC(1,9)= .177667D+01,SPEC(1,8)= .249525D+01,
SPEC(4,7)= .352672D+04,SPEC(9,6)= .833630D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148303D+01,SPEC(1,3)= .561812D+00,SPEC(1,2)= .132278D+01,
SPEC(14,1)= .621000D+03,SPEC(1,16)= .103145D+01,SPEC(1,17)= .100273D+01,
SPEC(1,22)= .102911D+01,SPEC(8,13)= .251449D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .401809D+03,SPEC(1,9)= .177063D+01,SPEC(1,8)= .249426D+01,
SPEC(4,7)= .358850D+04,SPEC(9,6)= .773966D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148376D+01,SPEC(1,3)= .563418D+00,SPEC(1,2)= .131973D+01,
SPEC(14,1)= .613000D+03,SPEC(1,16)= .104266D+01,SPEC(1,17)= .100547D+01,
SPEC(1,22)= .102901D+01,SPEC(8,13)= .265779D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .343603D+03,SPEC(1,9)= .180735D+01,SPEC(1,8)= .250861D+01,
SPEC(4,7)= .351368D+04,SPEC(9,6)= .785203D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149243D+01,SPEC(1,3)= .585941D+00,SPEC(1,2)= .133218D+01,
SPEC(14,1)= .612926D+03,SPEC(1,16)= .103806D+01,SPEC(1,17)= .100425D+01,
SPEC(1,22)= .108046D+01,SPEC(5,34)= .210000D+02,SPEC(8,13)= .258564D+01,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .309595D+03,SPEC(1,9)= .190460D+01,SPEC(1,8)= .253698D+01,
SPEC(4,7)= .332788D+04,SPEC(9,6)= .835517D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150638D+01,SPEC(1,3)= .678702D+00,SPEC(1,2)= .139905D+01,
SPEC(14,1)= .609715D+03,SPEC(1,16)= .102278D+01,SPEC(1,17)= .994778D+00,
SPEC(1,22)= .121493D+01,SPEC(5,34)= .265150D+02,SPEC(8,13)= .236625D+01,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .320439D+03,SPEC(1,9)= .197145D+01,SPEC(1,8)= .255467D+01,
SPEC(4,7)= .317394D+04,SPEC(9,6)= .902409D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151254D+01,SPEC(1,3)= .775112D+00,SPEC(1,2)= .147897D+01,
SPEC(14,1)= .596936D+03,SPEC(1,16)= .100657D+01,SPEC(1,17)= .972065D+00,
SPEC(1,22)= .131819D+01,SPEC(5,34)= .327035D+02,SPEC(8,13)= .218365D+01,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .343146D+03,SPEC(1,9)= .191558D+01,SPEC(1,8)= .255745D+01,
SPEC(4,7)= .304938D+04,SPEC(9,6)= .993475D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151301D+01,SPEC(1,3)= .825774D+00,SPEC(1,2)= .148148D+01,
SPEC(14,1)= .557700D+03,SPEC(1,16)= .987688D+00,SPEC(1,17)= .903780D+00,
SPEC(1,22)= .129530D+01,SPEC(5,34)= .362174D+02,SPEC(8,13)= .210136D+01,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .350408D+03,SPEC(1,9)= .188868D+01,SPEC(1,8)= .256449D+01,
SPEC(4,7)= .291313D+04,SPEC(9,6)= .107936D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151430D+01,SPEC(1,3)= .867745D+00,SPEC(1,2)= .146377D+01,
SPEC(14,1)= .525122D+03,SPEC(1,16)= .969864D+00,SPEC(1,17)= .848746D+00,
SPEC(1,22)= .131628D+01,SPEC(5,34)= .381561D+02,SPEC(8,13)= .201402D+01,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .360245D+03,SPEC(1,9)= .182161D+01,SPEC(1,8)= .256034D+01,
SPEC(4,7)= .278864D+04,SPEC(9,6)= .117998D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151221D+01,SPEC(1,3)= .895097D+00,SPEC(1,2)= .141838D+01,
SPEC(14,1)= .487376D+03,SPEC(1,16)= .950423D+00,SPEC(1,17)= .788730D+00,
SPEC(1,22)= .129468D+01,SPEC(5,34)= .383019D+02,SPEC(8,13)= .195712D+01,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .365910D+03,SPEC(1,9)= .176943D+01,SPEC(1,8)= .255059D+01,
SPEC(4,7)= .266858D+04,SPEC(9,6)= .128841D-01,SPEC(13,5)= .599105D+01,

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Listing of "supersonic.input" (Continued)

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SPEC(1,5)= .151014D+01,SPEC(1,3)= .927466D+00,SPEC(1,2)= .137999D+01,
SPEC(14,1)= .453985D+03,SPEC(1,16)= .930739D+00,SPEC(1,17)= .739806D+00,
SPEC(1,22)= .129113D+01,SPEC(5,34)= .380969D+02,SPEC(8,13)= .189901D+01,
&END
&D MACH= 1.60,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .370295D+03,SPEC(1,9)= .174158D+01,SPEC(1,8)= .254555D+01,
SPEC(4,7)= .255137D+04,SPEC(9,6)= .140143D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151177D+01,SPEC(1,3)= .978344D+00,SPEC(1,2)= .135930D+01,
SPEC(14,1)= .428389D+03,SPEC(1,16)= .912372D+00,SPEC(1,17)= .701725D+00,
SPEC(1,22)= .131646D+01,SPEC(5,34)= .382707D+02,SPEC(8,13)= .183223D+01,
&END
&D MACH= 1.80,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .382305D+03,SPEC(1,9)= .176482D+01,SPEC(1,8)= .249648D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .627320D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148840D+01,SPEC(1,3)= .578525D+00,SPEC(1,2)= .131885D+01,
SPEC(14,1)= .590000D+03,SPEC(1,16)= .107471D+01,SPEC(1,17)= .101271D+01,
SPEC(1,22)= .104455D+01,SPEC(8,13)= .311122D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.10,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .286074D+03,SPEC(1,9)= .180857D+01,SPEC(1,8)= .252868D+01,
SPEC(4,7)= .374818D+04,SPEC(9,6)= .487606D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150440D+01,SPEC(1,3)= .628459D+00,SPEC(1,2)= .127708D+01,
SPEC(14,1)= .526000D+03,SPEC(1,16)= .110522D+01,SPEC(1,17)= .980284D+00,
SPEC(1,22)= .119610D+01,SPEC(8,13)= .349503D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.40,ALTP= 50000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .350022D+03,SPEC(1,9)= .173677D+01,SPEC(1,8)= .252229D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .420093D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150234D+01,SPEC(1,3)= .818338D+00,SPEC(1,2)= .133318D+01,
SPEC(14,1)= .455000D+03,SPEC(1,16)= .111869D+01,SPEC(1,17)= .896230D+00,
SPEC(1,22)= .121401D+01,SPEC(8,13)= .383543D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .368418D+03,SPEC(1,9)= .176930D+01,SPEC(1,8)= .249787D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .795402D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149003D+01,SPEC(1,3)= .575812D+00,SPEC(1,2)= .131291D+01,
SPEC(14,1)= .590000D+03,SPEC(1,16)= .107448D+01,SPEC(1,17)= .101348D+01,
SPEC(1,22)= .105298D+01,SPEC(8,13)= .309616D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .327982D+03,SPEC(1,9)= .180527D+01,SPEC(1,8)= .251205D+01,
SPEC(4,7)= .367269D+04,SPEC(9,6)= .806839D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149718D+01,SPEC(1,3)= .597233D+00,SPEC(1,2)= .132217D+01,
SPEC(14,1)= .589525D+03,SPEC(1,16)= .106984D+01,SPEC(1,17)= .101152D+01,
SPEC(1,22)= .110563D+01,SPEC(5,34)= .210000D+02,SPEC(8,13)= .301649D+01,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .322791D+03,SPEC(1,9)= .188778D+01,SPEC(1,8)= .253735D+01,
SPEC(4,7)= .349944D+04,SPEC(9,6)= .868765D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150751D+01,SPEC(1,3)= .715075D+00,SPEC(1,2)= .141916D+01,
SPEC(14,1)= .587915D+03,SPEC(1,16)= .105398D+01,SPEC(1,17)= .100038D+01,
SPEC(1,22)= .121673D+01,SPEC(5,34)= .293648D+02,SPEC(8,13)= .274860D+01,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .337040D+03,SPEC(1,9)= .193217D+01,SPEC(1,8)= .255217D+01,
SPEC(4,7)= .334544D+04,SPEC(9,6)= .942465D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151226D+01,SPEC(1,3)= .809386D+00,SPEC(1,2)= .148560D+01,
SPEC(14,1)= .571754D+03,SPEC(1,16)= .103700D+01,SPEC(1,17)= .968794D+00,
SPEC(1,22)= .129688D+01,SPEC(5,34)= .353158D+02,SPEC(8,13)= .255759D+01,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .353615D+03,SPEC(1,9)= .190473D+01,SPEC(1,8)= .255897D+01,

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Listing of "supersonic.input" (Continued)

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SPEC (4,7)= .320663D+04,SPEC (9,6)= .103010D-01,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .151380D+01,SPEC (1,3)= .866642D+00,SPEC (1,2)= .149356D+01,
SPEC (14,1)= .539655D+03,SPEC (1,16)= .101865D+01,SPEC (1,17)= .910070D+00,
SPEC (1,22)= .130914D+01,SPEC (5,34)= .390440D+02,SPEC (8,13)= .247246D+01,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC (2,11)= .354715D+03,SPEC (1,9)= .185719D+01,SPEC (1,8)= .256175D+01,
SPEC (4,7)= .305998D+04,SPEC (9,6)= .111663D-01,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .151380D+01,SPEC (1,3)= .888181D+00,SPEC (1,2)= .143951D+01,
SPEC (14,1)= .503581D+03,SPEC (1,16)= .999241D+00,SPEC (1,17)= .849171D+00,
SPEC (1,22)= .131524D+01,SPEC (5,34)= .383032D+02,SPEC (8,13)= .234297D+01,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC (2,11)= .363337D+03,SPEC (1,9)= .180049D+01,SPEC (1,8)= .255500D+01,
SPEC (4,7)= .292902D+04,SPEC (9,6)= .121906D-01,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .151197D+01,SPEC (1,3)= .922313D+00,SPEC (1,2)= .140232D+01,
SPEC (14,1)= .469607D+03,SPEC (1,16)= .979077D+00,SPEC (1,17)= .795237D+00,
SPEC (1,22)= .130560D+01,SPEC (5,34)= .387744D+02,SPEC (8,13)= .227392D+01,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC (2,11)= .370456D+03,SPEC (1,9)= .175762D+01,SPEC (1,8)= .254622D+01,
SPEC (4,7)= .280489D+04,SPEC (9,6)= .133061D-01,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .151210D+01,SPEC (1,3)= .965879D+00,SPEC (1,2)= .137306D+01,
SPEC (14,1)= .439987D+03,SPEC (1,16)= .959244D+00,SPEC (1,17)= .749262D+00,
SPEC (1,22)= .131234D+01,SPEC (5,34)= .388507D+02,SPEC (8,13)= .220210D+01,
&END
&D MACH= 1.80,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC (2,11)= .387009D+03,SPEC (1,9)= .168978D+01,SPEC (1,8)= .252250D+01,
SPEC (4,7)= .269675D+04,SPEC (9,6)= .146741D-01,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .150794D+01,SPEC (1,3)= .101650D+01,SPEC (1,2)= .134815D+01,
SPEC (14,1)= .409254D+03,SPEC (1,16)= .937958D+00,SPEC (1,17)= .701851D+00,
SPEC (1,22)= .128383D+01,SPEC (5,34)= .388568D+02,SPEC (8,13)= .215014D+01,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC (2,11)= .286367D+03,SPEC (1,9)= .181028D+01,SPEC (1,8)= .252905D+01,
SPEC (4,7)= .375000D+04,SPEC (9,6)= .620459D-02,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .150492D+01,SPEC (1,3)= .631461D+00,SPEC (1,2)= .127860D+01,
SPEC (14,1)= .526000D+03,SPEC (1,16)= .110472D+01,SPEC (1,17)= .979918D+00,
SPEC (1,22)= .119973D+01,SPEC (8,13)= .348456D+01,SPEC (5,34)= .200000D+02,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC (2,11)= .343191D+03,SPEC (1,9)= .178776D+01,SPEC (1,8)= .252454D+01,
SPEC (4,7)= .373289D+04,SPEC (9,6)= .653713D-02,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .150345D+01,SPEC (1,3)= .717560D+00,SPEC (1,2)= .136081D+01,
SPEC (14,1)= .525589D+03,SPEC (1,16)= .109685D+01,SPEC (1,17)= .961341D+00,
SPEC (1,22)= .116053D+01,SPEC (5,34)= .288306D+02,SPEC (8,13)= .338755D+01,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC (2,11)= .357541D+03,SPEC (1,9)= .186272D+01,SPEC (1,8)= .255078D+01,
SPEC (4,7)= .356520D+04,SPEC (9,6)= .705582D-02,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .151197D+01,SPEC (1,3)= .854521D+00,SPEC (1,2)= .146764D+01,
SPEC (14,1)= .525781D+03,SPEC (1,16)= .108172D+01,SPEC (1,17)= .947315D+00,
SPEC (1,22)= .127004D+01,SPEC (5,34)= .384081D+02,SPEC (8,13)= .310199D+01,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC (2,11)= .357910D+03,SPEC (1,9)= .184136D+01,SPEC (1,8)= .255581D+01,
SPEC (4,7)= .340101D+04,SPEC (9,6)= .762385D-02,SPEC (13,5)= .599105D+01,
SPEC (1,5)= .151281D+01,SPEC (1,3)= .891430D+00,SPEC (1,2)= .143314D+01,
SPEC (14,1)= .496294D+03,SPEC (1,16)= .106210D+01,SPEC (1,17)= .893983D+00,
SPEC (1,22)= .130241D+01,SPEC (5,34)= .385948D+02,SPEC (8,13)= .298990D+01,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,

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Listing of "supersonic.input" (Continued)

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SPEC(2,11)= .367806D+03,SPEC(1,9)= .178071D+01,SPEC(1,8)= .254553D+01,
SPEC(4,7)= .325900D+04,SPEC(9,6)= .833446D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151016D+01,SPEC(1,3)= .925243D+00,SPEC(1,2)= .139539D+01,
SPEC(14,1)= .462094D+03,SPEC(1,16)= .104042D+01,SPEC(1,17)= .836825D+00,
SPEC(1,22)= .128697D+01,SPEC(5,34)= .389479D+02,SPEC(8,13)= .292207D+01,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .374933D+03,SPEC(1,9)= .174136D+01,SPEC(1,8)= .253652D+01,
SPEC(4,7)= .312162D+04,SPEC(9,6)= .908830D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151060D+01,SPEC(1,3)= .972022D+00,SPEC(1,2)= .136940D+01,
SPEC(14,1)= .434061D+03,SPEC(1,16)= .101973D+01,SPEC(1,17)= .790188D+00,
SPEC(1,22)= .129646D+01,SPEC(5,34)= .390588D+02,SPEC(8,13)= .283500D+01,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .375481D+03,SPEC(1,9)= .171184D+01,SPEC(1,8)= .252896D+01,
SPEC(4,7)= .298325D+04,SPEC(9,6)= .985260D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151170D+01,SPEC(1,3)= .101595D+01,SPEC(1,2)= .134412D+01,
SPEC(14,1)= .409306D+03,SPEC(1,16)= .999827D+00,SPEC(1,17)= .751337D+00,
SPEC(1,22)= .132323D+01,SPEC(5,34)= .381873D+02,SPEC(8,13)= .275004D+01,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .393935D+03,SPEC(1,9)= .164135D+01,SPEC(1,8)= .249842D+01,
SPEC(4,7)= .287204D+04,SPEC(9,6)= .108842D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150574D+01,SPEC(1,3)= .107184D+01,SPEC(1,2)= .132449D+01,
SPEC(14,1)= .380800D+03,SPEC(1,16)= .977794D+00,SPEC(1,17)= .702035D+00,
SPEC(1,22)= .128803D+01,SPEC(5,34)= .389295D+02,SPEC(8,13)= .274123D+01,
&END
&D MACH= 2.10,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .407426D+03,SPEC(1,9)= .158675D+01,SPEC(1,8)= .246112D+01,
SPEC(4,7)= .276127D+04,SPEC(9,6)= .119850D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149824D+01,SPEC(1,3)= .113507D+01,SPEC(1,2)= .130187D+01,
SPEC(14,1)= .356367D+03,SPEC(1,16)= .955732D+00,SPEC(1,17)= .658224D+00,
SPEC(1,22)= .127404D+01,SPEC(5,34)= .389901D+02,SPEC(8,13)= .263609D+01,
&END
&D MACH= 2.40,ALTP= 55000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .344132D+03,SPEC(1,9)= .174192D+01,SPEC(1,8)= .252418D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .532190D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150346D+01,SPEC(1,3)= .813637D+00,SPEC(1,2)= .132871D+01,
SPEC(14,1)= .455000D+03,SPEC(1,16)= .111885D+01,SPEC(1,17)= .897586D+00,
SPEC(1,22)= .122358D+01,SPEC(8,13)= .383252D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.50,ALTP= 60000.,ETAR= .8893,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .403188D+03,SPEC(1,9)= .177531D+01,SPEC(1,8)= .249264D+01,
SPEC(4,7)= .353739D+04,SPEC(9,6)= .145416D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148357D+01,SPEC(1,3)= .562427D+00,SPEC(1,2)= .132443D+01,
SPEC(14,1)= .625000D+03,SPEC(1,16)= .102664D+01,SPEC(1,17)= .100250D+01,
SPEC(1,22)= .102680D+01,SPEC(8,13)= .240492D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.53,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .403049D+03,SPEC(1,9)= .177247D+01,SPEC(1,8)= .249249D+01,
SPEC(4,7)= .355690D+04,SPEC(9,6)= .134561D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148379D+01,SPEC(1,3)= .562913D+00,SPEC(1,2)= .132278D+01,
SPEC(14,1)= .621000D+03,SPEC(1,16)= .103113D+01,SPEC(1,17)= .100273D+01,
SPEC(1,22)= .102654D+01,SPEC(8,13)= .251838D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.60,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .409156D+03,SPEC(1,9)= .176552D+01,SPEC(1,8)= .249113D+01,
SPEC(4,7)= .361933D+04,SPEC(9,6)= .124885D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .148418D+01,SPEC(1,3)= .563940D+00,SPEC(1,2)= .131973D+01,
SPEC(14,1)= .613000D+03,SPEC(1,16)= .104248D+01,SPEC(1,17)= .100547D+01,
SPEC(1,22)= .102479D+01,SPEC(8,13)= .266319D+01,SPEC(5,34)= .200000D+02,
&END

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Listing of "supersonic.input" (Continued)

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&D MACH= 1.80,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .361233D+03,SPEC(1,9)= .177347D+01,SPEC(1,8)= .249921D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .101299D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149163D+01,SPEC(1,3)= .580256D+00,SPEC(1,2)= .131522D+01,
SPEC(14,1)= .590000D+03,SPEC(1,16)= .107358D+01,SPEC(1,17)= .101318D+01,
SPEC(1,22)= .106033D+01,SPEC(8,13)= .309457D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.10,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .290832D+03,SPEC(1,9)= .181107D+01,SPEC(1,8)= .252950D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .794051D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150559D+01,SPEC(1,3)= .644056D+00,SPEC(1,2)= .128908D+01,
SPEC(14,1)= .526000D+03,SPEC(1,16)= .110332D+01,SPEC(1,17)= .977391D+00,
SPEC(1,22)= .120142D+01,SPEC(8,13)= .346154D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 1,INST= 0,
SPEC(2,11)= .342781D+03,SPEC(1,9)= .174475D+01,SPEC(1,8)= .252515D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .676955D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150433D+01,SPEC(1,3)= .816553D+00,SPEC(1,2)= .132911D+01,
SPEC(14,1)= .455000D+03,SPEC(1,16)= .111827D+01,SPEC(1,17)= .897466D+00,
SPEC(1,22)= .122990D+01,SPEC(8,13)= .381686D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .331868D+03,SPEC(1,9)= .177402D+01,SPEC(1,8)= .253840D+01,
SPEC(4,7)= .367683D+04,SPEC(9,6)= .686676D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150980D+01,SPEC(1,3)= .836503D+00,SPEC(1,2)= .132969D+01,
SPEC(14,1)= .453485D+03,SPEC(1,16)= .111354D+01,SPEC(1,17)= .894411D+00,
SPEC(1,22)= .128733D+01,SPEC(5,34)= .313403D+02,SPEC(8,13)= .372717D+01,
&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .366268D+03,SPEC(1,9)= .176979D+01,SPEC(1,8)= .254246D+01,
SPEC(4,7)= .352965D+04,SPEC(9,6)= .750863D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151324D+01,SPEC(1,3)= .959475D+00,SPEC(1,2)= .137581D+01,
SPEC(14,1)= .442488D+03,SPEC(1,16)= .109389D+01,SPEC(1,17)= .859450D+00,
SPEC(1,22)= .132006D+01,SPEC(5,34)= .389222D+02,SPEC(8,13)= .352249D+01,
&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .381089D+03,SPEC(1,9)= .170958D+01,SPEC(1,8)= .252282D+01,
SPEC(4,7)= .339215D+04,SPEC(9,6)= .824750D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151054D+01,SPEC(1,3)= .101072D+01,SPEC(1,2)= .135263D+01,
SPEC(14,1)= .413391D+03,SPEC(1,16)= .107097D+01,SPEC(1,17)= .807963D+00,
SPEC(1,22)= .130103D+01,SPEC(5,34)= .390745D+02,SPEC(8,13)= .345174D+01,
&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .385826D+03,SPEC(1,9)= .166782D+01,SPEC(1,8)= .250849D+01,
SPEC(4,7)= .325055D+04,SPEC(9,6)= .898487D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150959D+01,SPEC(1,3)= .105787D+01,SPEC(1,2)= .133095D+01,
SPEC(14,1)= .388356D+03,SPEC(1,16)= .104984D+01,SPEC(1,17)= .763890D+00,
SPEC(1,22)= .130943D+01,SPEC(5,34)= .388284D+02,SPEC(8,13)= .337109D+01,
&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .420342D+03,SPEC(1,9)= .157360D+01,SPEC(1,8)= .244293D+01,
SPEC(4,7)= .315080D+04,SPEC(9,6)= .101011D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149369D+01,SPEC(1,3)= .112535D+01,SPEC(1,2)= .130341D+01,
SPEC(14,1)= .356767D+03,SPEC(1,16)= .102228D+01,SPEC(1,17)= .703446D+00,
SPEC(1,22)= .123504D+01,SPEC(5,34)= .392312D+02,SPEC(8,13)= .337045D+01,
&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .456653D+03,SPEC(1,9)= .151309D+01,SPEC(1,8)= .237526D+01,
SPEC(4,7)= .304989D+04,SPEC(9,6)= .113063D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .147703D+01,SPEC(1,3)= .123197D+01,SPEC(1,2)= .128738D+01,
SPEC(14,1)= .334728D+03,SPEC(1,16)= .995487D+00,SPEC(1,17)= .655408D+00,
SPEC(1,22)= .120276D+01,SPEC(5,34)= .393235D+02,SPEC(8,13)= .332835D+01,

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Listing of "supersonic.input" (Continued)

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&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .531038D+03,SPEC(1,9)= .143997D+01,SPEC(1,8)= .227728D+01,
SPEC(4,7)= .297365D+04,SPEC(9,6)= .128931D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .145087D+01,SPEC(1,3)= .139009D+01,SPEC(1,2)= .127643D+01,
SPEC(14,1)= .314326D+03,SPEC(1,16)= .964898D+00,SPEC(1,17)= .605968D+00,
SPEC(1,22)= .114633D+01,SPEC(5,34)= .391411D+02,SPEC(8,13)= .330761D+01,
&END
&D MACH= 2.40,ALTP= 60000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .608298D+03,SPEC(1,9)= .137628D+01,SPEC(1,8)= .220870D+01,
SPEC(4,7)= .287905D+04,SPEC(9,6)= .144427D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .143413D+01,SPEC(1,3)= .154469D+01,SPEC(1,2)= .126995D+01,
SPEC(14,1)= .298751D+03,SPEC(1,16)= .938802D+00,SPEC(1,17)= .567402D+00,
SPEC(1,22)= .110956D+01,SPEC(5,34)= .391913D+02,SPEC(8,13)= .327507D+01,
&END
&D MACH= 1.80,ALTP= 65000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .338161D+03,SPEC(1,9)= .178649D+01,SPEC(1,8)= .250367D+01,
SPEC(4,7)= .373711D+04,SPEC(9,6)= .128815D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149510D+01,SPEC(1,3)= .582498D+00,SPEC(1,2)= .131091D+01,
SPEC(14,1)= .590000D+03,SPEC(1,16)= .107222D+01,SPEC(1,17)= .101373D+01,
SPEC(1,22)= .108204D+01,SPEC(8,13)= .305806D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.10,ALTP= 65000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .280841D+03,SPEC(1,9)= .182016D+01,SPEC(1,8)= .253138D+01,
SPEC(4,7)= .374990D+04,SPEC(9,6)= .100323D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150678D+01,SPEC(1,3)= .635771D+00,SPEC(1,2)= .127706D+01,
SPEC(14,1)= .526000D+03,SPEC(1,16)= .110339D+01,SPEC(1,17)= .980286D+00,
SPEC(1,22)= .121869D+01,SPEC(8,13)= .345629D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.40,ALTP= 65000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .336376D+03,SPEC(1,9)= .175160D+01,SPEC(1,8)= .252757D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .857881D-02,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150590D+01,SPEC(1,3)= .812881D+00,SPEC(1,2)= .132450D+01,
SPEC(14,1)= .455000D+03,SPEC(1,16)= .111818D+01,SPEC(1,17)= .898882D+00,
SPEC(1,22)= .124314D+01,SPEC(8,13)= .381330D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 1.80,ALTP= 70000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .343840D+03,SPEC(1,9)= .179313D+01,SPEC(1,8)= .250584D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .166716D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .149741D+01,SPEC(1,3)= .609306D+00,SPEC(1,2)= .133631D+01,
SPEC(14,1)= .590000D+03,SPEC(1,16)= .107203D+01,SPEC(1,17)= .101342D+01,
SPEC(1,22)= .109131D+01,SPEC(8,13)= .301269D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.10,ALTP= 70000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .277272D+03,SPEC(1,9)= .183687D+01,SPEC(1,8)= .253587D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .128637D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150905D+01,SPEC(1,3)= .648244D+00,SPEC(1,2)= .128111D+01,
SPEC(14,1)= .526000D+03,SPEC(1,16)= .110406D+01,SPEC(1,17)= .982142D+00,
SPEC(1,22)= .124721D+01,SPEC(8,13)= .340667D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.40,ALTP= 70000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .338963D+03,SPEC(1,9)= .175999D+01,SPEC(1,8)= .253098D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .110523D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .150815D+01,SPEC(1,3)= .835491D+00,SPEC(1,2)= .133418D+01,
SPEC(14,1)= .455000D+03,SPEC(1,16)= .111819D+01,SPEC(1,17)= .898505D+00,
SPEC(1,22)= .126167D+01,SPEC(8,13)= .375271D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.10,ALTP= 80000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 0,INST= 0,
SPEC(2,11)= .264181D+03,SPEC(1,9)= .189311D+01,SPEC(1,8)= .254680D+01,
SPEC(4,7)= .374367D+04,SPEC(9,6)= .210389D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151474D+01,SPEC(1,3)= .671756D+00,SPEC(1,2)= .127706D+01,
SPEC(14,1)= .526000D+03,SPEC(1,16)= .110508D+01,SPEC(1,17)= .989836D+00,

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Listing of "supersonic.input" (Continued)

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SPEC(1,22)= .134475D+01,SPEC(8,13)= .329519D+01,SPEC(5,34)= .200000D+02,
&END
&D MACH= 2.40,ALTP= 80000.,ETAR= .9320,MODE= 1,NVOPT= 0,IWT= 2,INST= 0,
SPEC(2,11)= .343524D+03,SPEC(1,9)= .178600D+01,SPEC(1,8)= .254050D+01,
SPEC(4,7)= .375000D+04,SPEC(9,6)= .183549D-01,SPEC(13,5)= .599105D+01,
SPEC(1,5)= .151472D+01,SPEC(1,3)= .890543D+00,SPEC(1,2)= .135501D+01,
SPEC(14,1)= .455000D+03,SPEC(1,16)= .111773D+01,SPEC(1,17)= .898571D+00,
SPEC(1,22)= .131852D+01,SPEC(8,13)= .363147D+01,SPEC(5,34)= .200000D+02,
&END
/*&D IWT=2,NVOPT=0,DEBUG=0, &END */
&W IPLT=T,ISII=F,ISIO=F,IOUTCD=2,PLOT=F,ACCS=0.11859149,
ILENG(1)=2,3,4,5,6,7,8,9,10,11,12,13,
DISKWT=0,DISKWC=1,
IWMEC(1,2)=41, 1, 1, 4, 0, 0, 0,
IWMEC(1,3)=7, 0, 0, 0, 0, 0, 0,
IWMEC(1,4)=2, 2, 0, 0, 0, 0, 0,
IWMEC(1,5)=47, 1, 0, 4, 0, 0, 0,
IWMEC(1,6)=2, 2, 0, 0, 0, 0, 0,
IWMEC(1,7)=21, 1, 0, 0, 0, 0, 0,
IWMEC(1,8)=51, 0, 5, -2, 0, 0, 0,
IWMEC(1,9)=52, 1, 2, -2, 2, 0, 0,
IWMEC(1,10)=2, 1, 0, 0, 0, 0, 0,
IWMEC(1,11)=82, 0, 0, 0, 0, 0, 0,
IWMEC(1,12)=23, 0, 0, 0, 0, 0, 0,
IWMEC(1,13)=9, 2, 11, 2, 0, 0, 0,
IWMEC(1,14)=2, 3, 0, 0, 0, 0, 0,
IWMEC(1,16)=11, 2, 8, 0, 0, 0, 5,
IWMEC(1,17)=11, 1, 9, 0, 0, 0, 2,
DESVAL(1,2)=.60,2.10,.38,1.10,3.0,2.0,.50,0,0,1.,0.120,3,1,
1,0,1.8,0,0,1650.,0.120,1.,1.,.95,1,0.120,
DESVAL(1,3)=15*0,
DESVAL(1,4)=.50,2.50,0,-1,10*0.5.,
DESVAL(1,5)=.50,1.63,.765,1.10,2.0,1.4,.35,0,0,1.,0.160,3,1,
1,0,1.2,0,0,1175.,0.160,1.,1.,0,0,0.160,
DESVAL(1,6)=.33,5.75, 0, -1, 10*0, 2.0,
DESVAL(1,7)=200.,.0075, 3*0, .20, .20,10*0,
DESVAL(1,8)=.25,.285,1.05,2.0,2.0,.45,175000.,3,1.,0,.323,0,.28,0,0,
DESVAL(1,9)=.43,.610,1.05,2.5,3.5,.50,200000.,2,1.,0,.323,0,.28,0,0,
DESVAL(1,10)=.60,0.5,0,-1,10*0.5.,
DESVAL(1,11)=0.50,8,12*0,1.5,
DESVAL(1,12)=550.,.00000005,12*0,0.0001,
DESVAL(1,13)=3.95,0.55,12*0,1.13,
DESVAL(1,14)=.50,0.,0,-1,10*0,1.5,
DESVAL(1,16)=80000.,.240,13*0,
DESVAL(1,17)=80000.,.240,13*0,
&END

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A.4 Listing of *supersonic.maps*

The NNEP code interpolates user-supplied functions to estimate component performance. These functions (data tables) can have up to three independent variables. Cubic Spline interpolation is employed to obtain the value of the dependent variable corresponding to the current values of the independent variables. In this file, performance maps for compressor and turbine may be defined. Three map properties are defined in the map file: pressure ratio, corrected flow and efficiency. For further details, refer to the NNEP user's manual [Ref 1].

Listing of "supersonic.maps"

6969	Generic 2D/AXI Nozzle Drag: Z=A9/A10, Y=Beta, X=M0						
Z 5	0.1000	0.2500	0.5000	0.7500	1.0000		
Y 9	0.0000	2.0000	4.0000	6.0000	8.0000	10.000	12.000
	14.000	16.000					
X 12	0.0000	0.6000	0.8000	0.9000	0.9500	1.0000	1.0200
	1.2000	1.5000	2.0000	2.5000	3.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0100	0.0150	0.0200	0.0180	0.0170	0.0150
	0.0120	0.0100	0.0080	0.0075	0.0070		
CD 12	0.0000	0.0180	0.0260	0.0260	0.0310	0.0400	0.0420
	0.0370	0.0310	0.0250	0.0210	0.0200		
CD 12	0.0000	0.0230	0.0350	0.0370	0.0460	0.0670	0.0860
	0.0720	0.0570	0.0460	0.0380	0.0340		
CD 12	0.0000	0.0290	0.0450	0.0530	0.0670	0.1350	0.1310
	0.1120	0.0890	0.0690	0.0570	0.0470		
CD 12	0.0000	0.0350	0.0530	0.0680	0.0900	0.1600	0.1860
	0.1540	0.1230	0.0910	0.0740	0.0610		
CD 12	0.0000	0.0400	0.0610	0.0830	0.1100	0.1850	0.2500
	0.2000	0.1580	0.1200	0.0920	0.0750		
CD 12	0.0000	0.0450	0.0680	0.0930	0.1350	0.2200	0.3100
	0.2500	0.1910	0.1410	0.1090	0.0880		
CD 12	0.0000	0.0500	0.0750	0.1100	0.1700	0.2550	0.4200
	0.3050	0.2250	0.1580	0.1230	0.1000		
Y 9	0.0000	2.0000	4.0000	6.0000	8.0000	10.000	12.000
	14.000	16.000					
X 12	0.0000	0.6000	0.8000	0.9000	0.9500	1.0000	1.0200
	1.2000	1.5000	2.0000	2.5000	3.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0100	0.0150	0.0200	0.0180	0.0170	0.0150
	0.0120	0.0100	0.0080	0.0075	0.0070		
CD 12	0.0000	0.0180	0.0260	0.0260	0.0310	0.0400	0.0420
	0.0370	0.0310	0.0250	0.0210	0.0200		
CD 12	0.0000	0.0230	0.0350	0.0370	0.0460	0.0650	0.0860
	0.0710	0.0570	0.0450	0.0370	0.0330		
CD 12	0.0000	0.0290	0.0450	0.0530	0.0670	0.1100	0.1310
	0.1110	0.0860	0.0650	0.0520	0.0430		
CD 12	0.0000	0.0350	0.0530	0.0680	0.0880	0.1500	0.1850
	0.1530	0.1180	0.0870	0.0670	0.0550		
CD 12	0.0000	0.0400	0.0610	0.0830	0.1040	0.1800	0.2500
	0.1980	0.1470	0.1050	0.0800	0.0650		
CD 12	0.0000	0.0450	0.0680	0.0920	0.1150	0.2150	0.3050
	0.2420	0.1770	0.1250	0.0940	0.0750		
CD 12	0.0000	0.0500	0.0750	0.1000	0.1200	0.2400	0.4150
	0.2860	0.2050	0.1400	0.1050	0.0850		
Y 9	0.0000	2.0000	4.0000	6.0000	8.0000	10.000	12.000
	14.000	16.000					
X 12	0.0000	0.6000	0.8000	0.9000	0.9500	1.0000	1.0200
	1.2000	1.5000	2.0000	2.5000	3.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0100	0.0150	0.0190	0.0170	0.0160	0.0150
	0.0110	0.0090	0.0070	0.0065	0.0060		
CD 12	0.0000	0.0170	0.0250	0.0250	0.0300	0.0380	0.0420
	0.0370	0.0290	0.0220	0.0180	0.0160		
CD 12	0.0000	0.0230	0.0340	0.0350	0.0450	0.0600	0.0820
	0.0690	0.0510	0.0370	0.0300	0.0250		
CD 12	0.0000	0.0290	0.0430	0.0500	0.0650	0.1000	0.1250
	0.1020	0.0750	0.0510	0.0400	0.0330		

Listing of "supersonic.maps" (Continued)

CD 12	0.0000	0.0350	0.0510	0.0650	0.0850	0.1400	0.1700
	0.1400	0.0970	0.0660	0.0500	0.0410		
CD 12	0.0000	0.0400	0.0590	0.0790	0.1000	0.1600	0.2100
	0.1670	0.1180	0.0790	0.0590	0.0470		
CD 12	0.0000	0.0450	0.0670	0.0870	0.1100	0.1750	0.2500
	0.1980	0.1360	0.0900	0.0670	0.0530		
CD 12	0.0000	0.0500	0.0750	0.0950	0.1150	0.1850	0.3000
	0.2270	0.1560	0.1010	0.0740	0.0590		
Y 9	0.0000	2.0000	4.0000	6.0000	8.0000	10.000	12.000
	14.000	16.000					
X 12	0.0000	0.6000	0.8000	0.9000	0.9500	1.0000	1.0200
	1.2000	1.5000	2.0000	2.5000	3.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0100	0.0150	0.0180	0.0170	0.0150	0.0140
	0.0100	0.0080	0.0060	0.0050	0.0040		
CD 12	0.0000	0.0160	0.0210	0.0250	0.0250	0.0300	0.0340
	0.0280	0.0210	0.0150	0.0110	0.0100		
CD 12	0.0000	0.0200	0.0250	0.0300	0.0350	0.0470	0.0600
	0.0480	0.0340	0.0230	0.0170	0.0140		
CD 12	0.0000	0.0240	0.0290	0.0350	0.0450	0.0700	0.1850
	0.0660	0.0460	0.0300	0.0220	0.0180		
CD 12	0.0000	0.0280	0.0330	0.0400	0.0500	0.0820	0.1100
	0.0840	0.0570	0.0380	0.0270	0.0210		
CD 12	0.0000	0.0320	0.0370	0.0450	0.0550	0.0900	0.1400
	0.1000	0.0650	0.0430	0.0320	0.0240		
CD 12	0.0000	0.0360	0.0410	0.0500	0.0600	0.0950	0.1600
	0.1140	0.0760	0.0490	0.0360	0.0270		
CD 12	0.0000	0.0400	0.0450	0.0550	0.0650	0.1000	0.1800
	0.1270	0.0850	0.0540	0.0390	0.0300		
Y 9	0.0000	2.0000	4.0000	6.0000	8.0000	10.000	12.000
	14.000	16.000					
X 12	0.0000	0.6000	0.8000	0.9000	0.9500	1.0000	1.0200
	1.2000	1.5000	2.0000	2.5000	3.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
CD 12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000		
EOT							
3000	G.E./P&W 7 STG HPC WITH 3 STGS OF VAR GEOM STATOR INCORPORATED						
ANGL 1	0.000						
SPED 12	0.40	0.50	0.60	0.70	0.750	0.800	0.850
	0.900	0.950	1.000	1.050	1.100		
R 7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
FLOW 7	15.994	16.294	16.540	16.741	16.903	17.033	17.170
FLOW 7	21.408	21.782	22.056	22.251	22.389	22.486	22.573
FLOW 7	28.875	29.424	29.769	29.967	30.076	30.131	30.154
FLOW 7	39.774	40.675	41.150	41.356	41.427	41.434	41.434

Listing of "supersonic.maps" (Continued)

FLOW	7	46.638	47.890	48.497	48.721	48.780	48.781	48.781
FLOW	7	55.389	57.123	57.858	58.080	58.125	58.125	58.125
FLOW	7	66.286	68.698	69.514	69.707	69.738	69.738	69.738
FLOW	7	77.297	80.039	80.805	80.958	80.973	80.973	80.973
FLOW	7	87.596	90.215	90.852	90.963	90.967	90.967	90.967
FLOW	7	97.727	99.901	100.36	100.42	100.42	100.42	100.42
FLOW	7	102.33	103.54	103.82	103.90	103.91	103.91	103.91
FLOW	7	105.16	105.72	105.88	105.94	105.97	105.99	106.00
EOT								
3001		G.E./P&W 7 STG HPC WITH 3 STGS OF VAR GEOM STATOR INCORPORATED						
ANGL	1	0.000						
SPED	12	0.40	0.50	0.60	0.70	0.750	0.800	0.850
		0.900	0.950	1.000	1.050	1.100		
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
EFF	7	0.7640	0.7448	0.7232	0.6988	0.6698	0.6363	0.5849
EFF	7	0.7651	0.7462	0.7249	0.6992	0.6693	0.6361	0.5878
EFF	7	0.7866	0.7698	0.7504	0.7255	0.6966	0.6652	0.6209
EFF	7	0.8196	0.8076	0.7910	0.7662	0.7364	0.7045	0.6614
EFF	7	0.8396	0.8315	0.8167	0.7907	0.7593	0.7261	0.6822
EFF	7	0.8555	0.8544	0.8408	0.8111	0.7759	0.7401	0.6941
EFF	7	0.8588	0.8676	0.8531	0.8183	0.7799	0.7424	0.6956
EFF	7	0.8588	0.8708	0.8532	0.8165	0.7779	0.7409	0.6956
EFF	7	0.8585	0.8683	0.8467	0.8094	0.7779	0.7409	0.6956
EFF	7	0.8521	0.8558	0.8292	0.7920	0.7555	0.7215	0.6803
EFF	7	0.8356	0.8338	0.8050	0.7692	0.7347	0.7025	0.6635
EFF	7	0.8083	0.7999	0.7691	0.7346	0.7016	0.6711	0.6342
EOT								
3002		G.E./P&W 7 STG HPC WITH 3 STGS OF VAR GEOM STATOR INCORPORATED						
ANGL	1	0.000						
SPED	12	0.40	0.50	0.60	0.70	0.750	0.800	0.850
		0.900	0.950	1.000	1.050	1.100		
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
PR	7	2.2607	2.1006	1.9599	1.8354	1.7241	1.6244	1.5067
PR	7	3.1187	2.8311	2.5864	2.3752	2.1923	2.0329	1.8508
PR	7	4.6343	4.1032	3.6672	3.3040	3.0002	2.7435	2.4584
PR	7	6.9901	6.0771	5.3400	4.7372	4.2440	3.8378	3.4026
PR	7	8.5954	7.4235	6.4748	5.7051	5.0834	4.5785	4.0430
PR	7	10.770	9.2652	8.0253	7.0245	6.2278	5.5889	4.9165
PR	7	13.633	11.689	10.047	8.7419	7.7201	6.9090	6.0601
PR	7	16.647	14.194	12.142	10.532	9.2837	8.2978	7.2687
PR	7	19.691	16.683	14.215	12.311	10.844	9.6883	8.4829
PR	7	22.992	19.337	16.416	14.213	12.524	11.194	9.8054
PR	7	24.412	20.283	17.234	14.959	13.209	11.824	10.373
PR	7	25.214	20.832	17.702	15.381	13.595	12.179	10.693
EOT								
2114		GE21FAN1 FRONT FAN						
ANGL	1	0.000						
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.95	1.000	1.050	1.100	
R	5	1.000	1.100	1.200	1.300	1.400		
FLOW	5	274.541	303.552	329.934	356.417	376.361		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
FLOW	6	297.911	328.097	356.701	382.013	402.611	414.456	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
FLOW	7	328.874	359.061	386.751	411.279	431.221	441.756	450.076
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
FLOW	8	366.535	395.414	422.183	445.135	463.241	472.466	478.951
		484.258						
FLOW	8	406.564	434.136	459.850	481.489	496.840	505.148	510.055
		514.838						
R	9	1.000	1.100	1.200	1.300	1.400	1.500	1.600

Listing of "supersonic.maps" (Continued)

		1.700	1.800					
FLOW	9	447.768	474.810	497.647	517.842	531.616	538.745	542.473
		545.425	547.445					
FLOW	9	488.584	513.393	535.704	553.801	565.218	571.160	573.842
		575.348	576.316					
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
FLOW	10	536.346	557.753	575.994	590.555	599.866	604.099	605.472
		606.056	606.110	606.302				
FLOW	10	582.938	601.843	617.596	628.351	635.301	636.914	637.891
		637.687	637.473	637.535				
R	11	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900	2.000			
FLOW	11	628.082	645.282	657.489	666.272	670.343	671.034	670.965
		671.019	670.811	670.733	670.520			
FLOW	11	671.394	685.176	693.196	700.007	701.577	701.088	701.150
		701.463	701.253	701.436	700.959			
FLOW	11	703.798	712.469	718.770	721.134	721.525	721.561	721.626
		721.810	721.466	721.254	721.041			
FLOW	11	722.500	728.000	732.000	734.000	734.000	734.500	734.500
		734.000	734.000	734.000	734.000			

EOT

2115

GE21FAN1 FRONT FAN

ANGL	1	0.000						
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	5	1.000	1.100	1.200	1.300	1.400		
EFF	5	0.800	0.840	0.870	0.860	0.800		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
EFF	6	0.790	0.840	0.869	0.875	0.840	0.790	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
EFF	7	0.790	0.835	0.866	0.880	0.864	0.830	0.790
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
EFF	8	0.800	0.840	0.881	0.888	0.872	0.850	0.820
		0.785						
EFF	8	0.805	0.842	0.880	0.885	0.878	0.860	0.835
		0.800						
R	9	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800					
EFF	9	0.815	0.850	0.880	0.885	0.878	0.864	0.844
		0.820	0.790					
EFF	9	0.820	0.850	0.882	0.884	0.880	0.866	0.850
		0.828	0.800					
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
EFF	10	0.830	0.855	0.883	0.884	0.880	0.869	0.853
		0.832	0.805	0.790				
EFF	10	0.835	0.857	0.884	0.885	0.880	0.870	0.856
		0.840	0.815	0.795				
R	11	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900	2.000			
EFF	11	0.840	0.860	0.874	0.880	0.875	0.865	0.855
		0.840	0.820	0.798	0.790			
EFF	11	0.830	0.850	0.856	0.860	0.855	0.845	0.835
		0.820	0.800	0.795	0.790			
EFF	11	0.810	0.817	0.820	0.820	0.810	0.800	0.797
		0.795	0.792	0.788	0.784			
EFF	11	0.790	0.790	0.794	0.795	0.794	0.792	0.790
		0.786	0.785	0.780	0.775			

EOT

2116

GE21FAN1 FRONT FAN

Listing of "supersonic.maps" (Continued)

ANGL	1	0.000					
SPED	13	0.500	0.550	0.600	0.650	0.700	0.800
		0.850	0.900	0.950	1.000	1.050	1.100
R	5	1.000	1.100	1.200	1.300	1.400	
PR	5	1.532	1.518	1.486	1.414	1.336	
R	6	1.000	1.100	1.200	1.300	1.400	1.500
PR	6	1.671	1.658	1.626	1.560	1.483	1.413
R	7	1.000	1.100	1.200	1.300	1.400	1.500
PR	7	1.828	1.816	1.785	1.719	1.639	1.565
R	8	1.000	1.100	1.200	1.300	1.400	1.500
		1.700					
PR	8	2.029	2.014	1.975	1.900	1.810	1.734
		1.591					
PR	8	2.249	2.235	2.183	2.099	1.997	1.917
		1.759					
R	9	1.000	1.100	1.200	1.300	1.400	1.500
		1.700	1.800				
PR	9	2.467	2.444	2.391	2.299	2.184	2.100
		1.939	1.839				
PR	9	2.692	2.653	2.595	2.494	2.375	2.277
		2.103	1.996				
R	10	1.000	1.100	1.200	1.300	1.400	1.500
		1.700	1.800	1.900			
PR	10	2.941	2.898	2.816	2.705	2.566	2.454
		2.269	2.162	2.066			
PR	10	3.199	3.131	3.042	2.911	2.760	2.641
		2.444	2.330	2.235			
R	11	1.000	1.100	1.200	1.300	1.400	1.500
		1.700	1.800	1.900	2.000		
PR	11	3.443	3.366	3.255	3.109	2.953	2.824
		2.624	2.517	2.408	2.295		
PR	11	3.685	3.581	3.464	3.302	3.124	2.989
		2.786	2.675	2.568	2.450		
PR	11	3.845	3.723	3.580	3.415	3.232	3.101
		2.903	2.789	2.677	2.564		
PR	11	3.960	3.830	3.680	3.500	3.320	3.200
		3.000	2.875	2.770	2.650		
EOT							
2117		GE21FAN2 CORE DRIVEN NESTED FAN					
ANGL	2	1.000	2.000				
SPED	13	0.500	0.550	0.600	0.650	0.700	0.8000
		0.850	0.900	0.950	1.000	1.050	1.100
R	6	1.000	1.060	1.120	1.180	1.240	1.300
FLOW	6	20.709	21.719	23.417	24.698	25.733	26.621
R	7	1.000	1.060	1.120	1.180	1.240	1.300
FLOW	7	23.753	24.418	26.043	27.226	28.261	29.271
R	8	1.000	1.060	1.120	1.180	1.240	1.300
		1.420					
FLOW	8	26.575	27.412	29.110	30.170	31.279	32.167
		33.526					
R	9	1.000	1.060	1.120	1.180	1.240	1.300
		1.420	1.480				
FLOW	9	30.698	31.387	32.717	33.998	34.934	35.847
		37.256	37.801				
R	10	1.000	1.060	1.120	1.180	1.240	1.300
		1.420	1.480	1.540			
FLOW	10	34.869	35.361	36.888	38.022	38.663	39.600
		41.255	41.628	42.077			
R	11	1.000	1.060	1.120	1.180	1.240	1.300
		1.420	1.480	1.540	1.600		
FLOW	11	39.701	40.513	41.868	43.173	44.159	44.924
		46.382	46.952	47.253	47.381		

Listing of "supersonic.maps" (Continued)

R	12	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660		
FLOW	12	46.152	47.038	48.196	49.525	50.560	51.302	52.067
		52.784	53.330	53.557	53.539	53.716		
R	13	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	
FLOW	13	54.735	55.891	57.245	58.477	59.488	60.302	61.043
		61.637	62.231	62.509	62.490	62.521	62.651	
R	14	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780
FLOW	14	66.429	67.610	68.890	70.048	71.476	72.192	73.055
		73.625	74.195	74.620	74.602	74.658	74.690	74.747
R	15	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780
		1.840						
FLOW	15	78.609	79.617	80.969	82.298	83.701	84.736	85.575
		86.439	87.083	87.458	87.588	87.597	87.507	87.565
		87.565						
R	16	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780
		1.840	1.900					
FLOW	16	90.507	91.441	92.867	94.170	95.548	96.729	97.642
		98.678	99.371	99.821	99.929	100.035	99.971	99.956
		99.956	99.956					
FLOW	16	94.591	95.893	96.902	98.107	99.535	100.447	101.432
		102.371	103.040	103.343	103.573	103.656	103.617	103.578
		103.578	103.578					
FLOW	16	97.771	98.877	99.812	100.993	102.273	103.161	103.877
		104.815	105.388	105.691	105.823	105.882	105.868	105.756
		104.815	104.815					
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.8000
		0.850	0.900	0.950	1.000	1.050	1.100	
R	5	1.000	1.100	1.200	1.300	1.400		
FLOW	5	34.419	36.089	37.836	38.996	39.975		
FLOW	5	37.894	39.509	41.155	42.365	43.139		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
FLOW	6	42.009	43.573	44.984	46.403	47.253	47.590	
FLOW	6	45.970	47.349	48.815	50.257	50.877	51.037	
FLOW	6	50.467	51.641	53.439	54.600	55.349	55.431	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
FLOW	7	55.682	57.087	58.522	60.095	60.869	61.032	61.058
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
FLOW	8	61.766	63.195	64.682	66.461	67.260	67.525	67.504
		67.408						
FLOW	8	68.872	70.066	71.837	73.588	74.624	75.017	75.023
		75.059						
R	9	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800					
FLOW	9	76.275	77.650	79.727	81.734	83.130	83.628	83.715
		83.702	83.765					
FLOW	9	83.618	85.457	87.507	89.718	91.191	91.947	91.908
		91.899	91.940					
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
FLOW	10	90.974	93.044	95.249	97.279	98.984	99.741	99.708
		99.651	99.719	99.608				
FLOW	10	94.978	96.972	99.176	101.079	102.603	103.212	103.284
		103.203	103.274	103.163				
FLOW	10	97.829	99.825	101.952	103.575	104.924	105.456	105.479
		105.451	105.422	105.390				
EOT								

Listing of "supersonic.maps" (Continued)

2118		GE21FAN2 CORE DRIVEN NESTED FAN						
ANGL	2	1.000	2.000					
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	6	1.000	1.060	1.120	1.180	1.240	1.300	
EFF	6	0.840	0.850	0.840	0.700	0.600	0.550	
R	7	1.000	1.060	1.120	1.180	1.240	1.300	1.360
EFF	7	0.840	0.855	0.855	0.810	0.680	0.600	0.550
R	8	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420						
EFF	8	0.840	0.850	0.860	0.840	0.770	0.650	0.600
		0.550						
R	9	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480					
EFF	9	0.840	0.849	0.860	0.855	0.830	0.760	0.650
		0.600	0.550					
R	10	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540				
EFF	10	0.840	0.848	0.860	0.860	0.850	0.800	0.750
		0.650	0.600	0.550				
R	11	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600			
EFF	11	0.838	0.846	0.858	0.865	0.860	0.840	0.810
		0.760	0.680	0.600	0.550			
R	12	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660		
EFF	12	0.836	0.845	0.855	0.862	0.865	0.860	0.845
		0.820	0.790	0.680	0.600	0.550		
R	13	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	
EFF	13	0.831	0.842	0.853	0.860	0.863	0.865	0.860
		0.850	0.840	0.800	0.730	0.670	0.600	
R	14	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780
EFF	14	0.820	0.830	0.840	0.852	0.860	0.865	0.870
		0.865	0.856	0.840	0.815	0.780	0.730	0.660
R	15	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780
		1.840						
EFF	15	0.802	0.806	0.814	0.828	0.840	0.850	0.855
		0.860	0.860	0.856	0.840	0.820	0.790	0.750
		0.700						
R	16	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780
		1.840	1.900					
EFF	16	0.785	0.790	0.795	0.802	0.808	0.816	0.824
		0.830	0.834	0.832	0.824	0.810	0.801	0.770
		0.740	0.695					
EFF	16	0.770	0.780	0.792	0.797	0.802	0.806	0.811
		0.817	0.820	0.820	0.810	0.805	0.780	0.760
		0.740	0.700					
EFF	16	0.740	0.750	0.760	0.770	0.780	0.790	0.790
		0.794	0.795	0.796	0.790	0.780	0.770	0.750
		0.730	0.680					
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	5	1.000	1.100	1.200	1.300	1.400		
EFF	5	0.845	0.844	0.790	0.600	0.500		
EFF	5	0.845	0.850	0.810	0.680	0.520		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
EFF	6	0.845	0.855	0.835	0.760	0.620	0.490	
EFF	6	0.845	0.855	0.845	0.810	0.690	0.530	

Listing of "supersonic.maps" (Continued)

EFF	6	0.844	0.852	0.852	0.826	0.760	0.630	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
EFF	7	0.843	0.850	0.855	0.844	0.815	0.700	0.630
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
EFF	8	0.835	0.844	0.853	0.852	0.830	0.780	0.700
		0.620						
EFF	8	0.825	0.835	0.850	0.855	0.849	0.820	0.760
		0.680						
R	9	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800					
EFF	9	0.805	0.820	0.835	0.850	0.852	0.835	0.810
		0.750	0.650					
EFF	9	0.770	0.809	0.819	0.835	0.844	0.834	0.810
		0.770	0.710					
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
EFF	10	0.700	0.750	0.805	0.822	0.823	0.820	0.810
		0.770	0.725	0.670				
EFF	10	0.700	0.740	0.780	0.810	0.820	0.815	0.800
		0.760	0.720	0.670				
EFF	10	0.700	0.720	0.750	0.780	0.800	0.800	0.775
		0.750	0.710	0.650				
EOT								
2119		GE21FAN2	CORE	DRIVEN	NESTED	FAN		
ANGL	2	1.000	2.000					
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	6	1.000	1.060	1.120	1.180	1.240	1.300	
PR	6	1.061	1.047	1.032	1.018	1.005	0.984	
R	7	1.000	1.060	1.120	1.180	1.240	1.300	1.360
PR	7	1.075	1.066	1.049	1.030	1.018	1.002	0.983
R	8	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420						
PR	8	1.091	1.083	1.069	1.051	1.037	1.021	1.003
		0.979						
R	9	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480					
PR	9	1.116	1.108	1.093	1.078	1.064	1.044	1.026
		1.005	0.984					
R	10	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540				
PR	10	1.145	1.139	1.124	1.105	1.091	1.076	1.056
		1.033	1.011	0.980				
R	11	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600			
PR	11	1.186	1.179	1.162	1.146	1.134	1.115	1.095
		1.074	1.049	1.021	0.994			
R	12	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660		
PR	12	1.237	1.231	1.215	1.202	1.188	1.167	1.148
		1.126	1.100	1.072	1.039	1.013		
R	13	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	
PR	13	1.321	1.313	1.300	1.282	1.268	1.252	1.229
		1.210	1.189	1.152	1.124	1.090	1.053	
R	14	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780
PR	14	1.447	1.440	1.430	1.415	1.399	1.384	1.366
		1.342	1.315	1.282	1.251	1.217	1.179	1.140
R	15	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780

Listing of "supersonic.maps" (Continued)

		1.840						
PR	15	1.606	1.602	1.597	1.585	1.573	1.560	1.543
		1.520	1.496	1.462	1.427	1.385	1.342	1.301
		1.260						
R	16	1.000	1.060	1.120	1.180	1.240	1.300	1.360
		1.420	1.480	1.540	1.600	1.660	1.720	1.780
		1.840	1.900					
PR	16	1.815	1.815	1.813	1.804	1.796	1.788	1.771
		1.749	1.722	1.687	1.638	1.601	1.552	1.503
		1.425	1.390					
PR	16	1.909	1.910	1.905	1.898	1.887	1.872	1.858
		1.834	1.803	1.763	1.719	1.675	1.623	1.573
		1.520	1.460					
PR	16	1.981	1.979	1.974	1.965	1.951	1.935	1.919
		1.895	1.860	1.819	1.773	1.726	1.673	1.617
		1.570	1.500					
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	5	1.000	1.100	1.200	1.300	1.400		
PR	5	1.112	1.083	1.056	1.015	0.974		
PR	5	1.134	1.111	1.079	1.042	0.999		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
PR	6	1.166	1.142	1.115	1.073	1.033	0.986	
PR	6	1.197	1.180	1.147	1.110	1.066	1.012	
PR	6	1.238	1.218	1.192	1.151	1.106	1.053	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
PR	7	1.289	1.272	1.248	1.208	1.165	1.107	1.061
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
PR	8	1.357	1.343	1.319	1.280	1.238	1.181	1.129
		1.071						
PR	8	1.444	1.435	1.409	1.375	1.326	1.271	1.215
		1.154						
R	9	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800					
PR	9	1.554	1.544	1.526	1.495	1.449	1.392	1.330
		1.264	1.199					
PR	9	1.677	1.670	1.653	1.628	1.582	1.526	1.459
		1.385	1.315					
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
PR	10	1.823	1.818	1.802	1.778	1.733	1.674	1.598
		1.517	1.443	1.368				
PR	10	1.914	1.906	1.893	1.863	1.818	1.748	1.668
		1.584	1.506	1.430				
PR	10	1.989	1.976	1.961	1.924	1.870	1.799	1.713
		1.628	1.545	1.466				
EOT								
2120		GE21HPC NESTED HPC						
ANGL	2	1.00	2.00					
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	3	1.000	1.100	1.200				
FLOW	3	21.002	23.396	24.856				
FLOW	3	23.923	26.145	27.802				
R	4	1.000	1.100	1.200	1.300			
FLOW	4	27.211	29.459	30.993	31.891			
FLOW	4	31.164	33.386	34.946	36.016			
R	5	1.000	1.100	1.200	1.300	1.400		
FLOW	5	35.436	37.412	39.094	40.041	40.499		
FLOW	5	40.245	42.640	44.249	45.417	45.972		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	

Listing of "supersonic.maps" (Continued)

FLOW	6	46.973	49.145	50.754	52.020	52.625	52.741	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
FLOW	7	55.342	57.761	59.442	60.979	61.706	61.945	61.890
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
FLOW	8	67.565	69.834	71.665	73.250	74.076	74.462	74.358
		74.424						
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
FLOW	10	79.442	81.982	84.008	85.691	86.786	87.590	87.758
		87.751	87.770	87.791				
R	11	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900	2.000			
FLOW	11	93.376	95.374	97.425	98.592	99.688	100.320	100.464
		100.532	100.477	100.476	100.471			
FLOW	11	99.066	100.352	101.764	102.884	103.586	103.949	104.044
		103.940	104.009	104.034	104.004			
FLOW	11	102.034	103.294	104.339	105.139	105.793	106.107	106.104
		106.124	106.119	106.142	106.040			
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	3	1.000	1.100	1.200				
FLOW	3	37.074	37.535	37.890				
FLOW	3	40.642	41.161	41.487				
R	4	1.000	1.100	1.200	1.300			
FLOW	4	45.044	45.445	45.771	45.950			
FLOW	4	49.153	49.612	49.910	50.028			
R	5	1.000	1.100	1.200	1.300	1.400		
FLOW	5	54.067	54.382	54.707	54.753	54.695		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
FLOW	6	59.759	60.059	60.384	60.577	60.518	60.606	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
FLOW	7	66.289	66.823	67.205	67.369	67.397	67.396	67.411
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
FLOW	8	73.437	74.072	74.661	74.998	75.071	75.142	75.125
		75.152						
R	9	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800					
FLOW	9	80.735	81.518	82.400	83.308	83.775	83.934	83.902
		83.869	83.893					
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
FLOW	10	87.745	88.602	89.704	90.847	91.754	92.307	92.493
		92.460	92.484	92.477				
R	11	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900	2.000			
FLOW	11	95.140	96.011	97.259	98.417	99.455	100.081	100.370
		100.410	100.460	100.439	100.412			
FLOW	11	99.396	100.063	101.119	102.233	103.182	103.676	103.891
		103.902	103.922	103.945	103.976			
FLOW	11	101.804	102.470	103.513	104.465	105.296	105.775	105.960
		105.986	106.005	106.014	106.043			
EOT								
2121		GE21HPC	NESTED	HPC				
ANGL	2	1.00	2.00					
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	3	1.000	1.100	1.200				
EFF	3	0.820	0.820	0.740				
EFF	3	0.830	0.836	0.790				
R	4	1.000	1.100	1.200	1.300			

Listing of "supersonic.maps" (Continued)

EFF	4	0.840	0.848	0.820	0.740			
EFF	4	0.840	0.853	0.845	0.750			
R	5	1.000	1.100	1.200	1.300	1.400		
EFF	5	0.840	0.856	0.853	0.810	0.730		
EFF	5	0.840	0.856	0.861	0.845	0.760		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
EFF	6	0.840	0.857	0.867	0.861	0.820	0.740	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
EFF	7	0.840	0.860	0.870	0.872	0.860	0.810	0.735
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
EFF	8	0.840	0.860	0.872	0.878	0.875	0.854	0.805
		0.750						
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
EFF	10	0.835	0.853	0.866	0.874	0.874	0.870	0.840
		0.800	0.750	0.690				
R	11	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900	2.000			
EFF	11	0.836	0.847	0.857	0.860	0.860	0.860	0.835
		0.810	0.760	0.720	0.670			
EFF	11	0.813	0.817	0.820	0.820	0.820	0.810	0.790
		0.770	0.730	0.680	0.650			
EFF	11	0.800	0.800	0.800	0.800	0.800	0.790	0.775
		0.750	0.720	0.680	0.650			
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	3	1.000	1.100	1.200				
EFF	3	0.840	0.800	0.770				
EFF	3	0.845	0.820	0.770				
R	4	1.000	1.100	1.200	1.300			
EFF	4	0.855	0.830	0.780	0.760			
EFF	4	0.860	0.840	0.790	0.770			
R	5	1.000	1.100	1.200	1.300	1.400		
EFF	5	0.865	0.855	0.826	0.780	0.760		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
EFF	6	0.871	0.870	0.850	0.815	0.770	0.755	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
EFF	7	0.874	0.874	0.870	0.855	0.790	0.770	0.750
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
EFF	8	0.877	0.879	0.878	0.870	0.840	0.790	0.770
		0.755						
R	9	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800					
EFF	9	0.870	0.873	0.875	0.873	0.870	0.850	0.810
		0.780	0.760					
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
EFF	10	0.860	0.864	0.870	0.871	0.871	0.865	0.845
		0.815	0.780	0.760				
R	11	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900	2.000			
EFF	11	0.845	0.850	0.856	0.860	0.862	0.860	0.845
		0.826	0.789	0.772	0.750			
EFF	11	0.815	0.816	0.820	0.823	0.823	0.820	0.800
		0.785	0.772	0.760	0.740			
EFF	11	0.780	0.790	0.790	0.790	0.790	0.790	0.782
		0.780	0.770	0.758	0.735			
EOT								
2122		GE21HPC NESTED HPC						
ANGL	2	1.00	2.00					

Listing of "supersonic.maps" (Continued)

SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	3	1.000	1.100	1.200				
PR	3	1.881	1.699	1.469				
PR	3	2.202	2.010	1.761				
R	4	1.000	1.100	1.200	1.300			
PR	4	2.584	2.345	2.096	1.718			
PR	4	2.977	2.771	2.498	2.120			
R	5	1.000	1.100	1.200	1.300	1.400		
PR	5	3.408	3.197	2.924	2.565	2.083		
PR	5	3.962	3.752	3.465	3.116	2.662		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
PR	6	4.619	4.422	4.154	3.829	3.346	2.759	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
PR	7	5.551	5.336	5.106	4.781	4.327	3.764	3.115
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
PR	8	6.872	6.728	6.455	6.149	5.705	5.141	4.497
		3.939						
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
PR	10	8.220	8.100	7.875	7.574	7.187	6.657	6.004
		5.398	4.773	4.072				
R	11	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900	2.000			
PR	11	9.997	9.877	9.628	9.293	8.892	8.343	7.647
		7.022	6.373	5.582	4.933			
PR	11	10.742	10.573	10.262	9.890	9.440	8.849	8.153
		7.509	6.832	5.998	5.364			
PR	11	11.129	10.989	10.611	10.214	9.770	9.159	8.416
		7.757	7.099	6.318	5.626			
SPED	13	0.500	0.550	0.600	0.650	0.700	0.750	0.800
		0.850	0.900	0.950	1.000	1.050	1.100	
R	3	1.000	1.100	1.200				
PR	3	2.550	2.371	2.094				
PR	3	2.841	2.656	2.385				
R	4	1.000	1.100	1.200	1.300			
PR	4	3.237	3.006	2.707	2.397			
PR	4	3.582	3.340	3.069	2.685			
R	5	1.000	1.100	1.200	1.300	1.400		
PR	5	4.016	3.819	3.497	3.142	2.690		
R	6	1.000	1.100	1.200	1.300	1.400	1.500	
PR	6	4.576	4.403	4.081	3.748	3.279	2.832	
R	7	1.000	1.100	1.200	1.300	1.400	1.500	1.600
PR	7	5.396	5.205	4.871	4.521	4.029	3.554	3.119
R	8	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700						
PR	8	6.356	6.141	5.886	5.473	5.043	4.533	4.018
		3.480						
R	9	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800					
PR	9	7.452	7.311	7.072	6.747	6.321	5.822	5.279
		4.713	4.129					
R	10	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900				
PR	10	8.653	8.546	8.346	8.082	7.706	7.240	6.672
		6.123	5.493	4.835				
R	11	1.000	1.100	1.200	1.300	1.400	1.500	1.600
		1.700	1.800	1.900	2.000			
PR	11	10.029	9.911	9.721	9.463	9.075	8.625	8.069
		7.519	6.827	6.191	5.356			
PR	11	10.843	10.726	10.480	10.194	9.794	9.288	8.715

Listing of "supersonic.maps" (Continued)

		8.171	7.444	6.798	5.973		
PR	11	11.346	11.194	10.983	10.675	10.236	9.695
		8.590	7.829	7.216	6.306		9.105
EOT							
3501 FLADE TIP MOUNTED FAN							
ANGL	5	-5.0	0.0	50.0	65.0	85.0	
SPED	2	0.95	1.00				
R	8	1.0	1.2	1.4	1.6	1.7	1.8
		2.0					
FLOW	8	272.	300.	318.	330.	336.	338.
		340.					339.5
FLOW	8	304.	321.	339.	346.	349.	351.
		354.					353.
SPED	12	0.40	0.50	0.60	0.70	0.75	0.80
		0.90	0.95	1.00	1.05	1.10	0.85
R	6	1.0	1.1	1.2	1.3	1.4	1.5
FLOW	6	84.	118.	127.	134.	141.	147.
R	7	1.0	1.1	1.2	1.3	1.4	1.5
FLOW	7	106.	132.	143.	152.	159.	165.
R	9	1.0	1.1	1.2	1.3	1.4	1.5
		1.7	1.8				
FLOW	9	129.	148.	159.	168.	178.	185.
		196.	200.				191.
R	10	1.0	1.1	1.2	1.3	1.4	1.5
		1.7	1.8	1.9			1.6
FLOW	10	156.	167.	180.	190.	199.	206.
		216.	219.	221.			212.
FLOW	10	170.	179.	191.	202.	210.	217.
		227.	229.	230.			223.
FLOW	10	184.	191.	204.	214.	222.	228.
		237.	239.	239.5			234.
FLOW	10	199.	204.	217.	227.	235.	241.
		248.	248.5	248.5			246.
FLOW	10	212.	217.	232.	241.	248.	253.
		258.	258.	258.			256.
FLOW	10	226.	235.	248.	256.	262.	266.
		268.5	268.5	268.5			268.
FLOW	10	240.	252.	264.	272.	276.	278.
		279.	279.	279.			279.
FLOW	10	252.	267.	279.	284.	287.	288.
		288.	288.	288.			288.
FLOW	10	260.	282.	291.	294.	295.5	295.5
		295.5	295.5	295.5			295.5
SPED	12	0.40	0.50	0.60	0.70	0.75	0.80
		0.90	0.95	1.00	1.05	1.10	0.85
R	4	1.0	1.1	1.2	1.3		
FLOW	4	59.	67.5	72.	75.5		
R	6	1.0	1.1	1.2	1.3	1.4	1.5
FLOW	6	74.5	80.	84.5	88.7	92.	94.5
R	7	1.0	1.1	1.2	1.3	1.4	1.5
FLOW	7	88.	93.	98.	102.5	106.	108.5
R	8	1.0	1.1	1.2	1.3	1.4	1.5
		1.7					
FLOW	8	103.	109.	113.5	118.	121.	123.
		127.					125.
R	9	1.0	1.1	1.2	1.3	1.4	1.5
		1.7	1.8				1.6
FLOW	9	111.	117.	121.5	125.5	128.5	131.
		134.	136.				132.5
FLOW	9	117.	125.5	129.5	133.	136.	138.
		141.5	143.				140.
FLOW	9	124.	133.5	137.5	141.	144.	145.5
							147.

Listing of "supersonic.maps" (Continued)

	148.7	150.					
FLOW 9	130.	141.5	145.5	149.	151.5	153.	154.5
	156.	157.					
FLOW 9	140.	149.	153.5	157.	159.5	161.	162.5
	163.5	164.5					
R 10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
	1.7	1.8	1.9				
FLOW 10	149.5	157.5	162.	165.5	167.5	169.	170.
	171.	172.	173.				
FLOW 10	160.	166.	170.	173.	175.	176.5	177.3
	178.	178.5	179.				
FLOW 10	166.	173.5	177.5	180.	181.5	182.5	183.
	183.5	184.	184.2				
SPED 12	0.40	0.50	0.60	0.70	0.75	0.80	0.85
	0.90	0.95	1.00	1.05	1.10		
R 7	1.0	1.1	1.2	1.3	1.4	1.5	1.6
FLOW 7	45.	48.	49.5	51.3	52.	52.3	52.6
R 8	1.0	1.1	1.2	1.3	1.4	1.5	1.6
	1.7						
FLOW 8	57.	58.	60.	61.5	62.	63.	63.3
	64.5						
R 9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
	1.7	1.8					
FLOW 9	68.	68.7	70.2	71.5	72.3	73.	74.
	75.	76.					
R 10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
	1.7	1.8	1.9				
FLOW 10	78.7	79.	80.5	81.5	82.7	83.2	84.
	85.	86.	87.				
FLOW 10	84.	84.5	86.	86.7	87.7	88.2	89.
	90.	91.	92.				
FLOW 10	89.	89.8	91.	92.	92.6	93.5	94.
	95.	96.	96.5				
FLOW 10	94.	95.	96.	97.	97.5	98.5	99.
	99.8	100.5	101.3				
FLOW 10	99.	100.3	101.2	102.	103.	103.5	104.
	104.7	105.3	106.				
FLOW 10	104.	106.	107.	107.5	108.	108.8	109.
	110.	110.5	111.				
FLOW 10	109.5	111.3	112.	112.8	113.3	114.	114.5
	115.	115.5	116.				
FLOW 10	114.5	116.5	117.2	117.8	118.2	118.8	119.
	119.3	119.8	120.				
FLOW 10	119.	121.	121.5	122.	122.1	122.5	122.9
	123.	123.1	123.3				
SPED 12	0.40	0.50	0.60	0.70	0.75	0.80	0.85
	0.90	0.95	1.00	1.05	1.10		
R 10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
	1.7	1.8	1.9				
FLOW 10	12.15	12.18	12.20	12.21	12.23	12.25	12.27
	12.30	12.32	12.35				
FLOW 10	14.68	14.69	14.70	14.72	14.75	14.77	14.79
	14.80	14.81	14.82				
FLOW 10	16.82	16.83	16.84	16.85	16.88	16.89	16.90
	16.91	16.92	16.93				
FLOW 10	18.65	18.67	18.69	18.70	18.70	18.70	18.71
	18.72	18.74	18.75				
FLOW 10	19.53	19.54	19.55	19.56	19.58	19.59	19.60
	19.60	19.60	19.61				
FLOW 10	20.32	20.33	20.34	20.34	20.35	20.37	20.38
	20.39	20.40	20.40				
FLOW 10	21.25	21.25	21.26	21.28	21.29	21.30	21.30

Listing of "supersonic.maps" (Continued)

		21.30	21.30	21.31				
FLOW 10		22.10	22.10	22.10	22.10	22.10	22.11	22.11
		22.12	22.13	22.14				
FLOW 10		23.30	23.30	23.30	23.30	23.30	23.31	23.31
		23.31	23.31	23.32				
FLOW 10		24.40	24.40	24.40	24.40	24.40	24.40	24.40
		24.41	24.41	24.41				
FLOW 10		25.18	25.18	25.18	25.18	25.18	25.18	25.18
		25.19	25.19	25.19				
FLOW 10		25.30	25.30	25.30	25.30	25.30	25.30	25.30
		25.30	25.30	25.30				
EOT								
3502	FLADE TIP MOUNTED FAN							
ANGL 5		-5.0	0.0	50.0	65.0	85.0		
SPED 2		0.95	1.00					
R 8		1.0	1.2	1.4	1.6	1.7	1.8	1.9
		2.0						
EFF 8		.725	.825	.870	.891	.880	.850	.840
		.835						
EFF 8		.880	.891	.890	.860	.850	.835	.825
		.800						
SPED 12		0.40	0.50	0.60	0.70	0.75	0.80	0.85
		0.90	0.95	1.00	1.05	1.10		
R 6		1.0	1.1	1.2	1.3	1.4	1.5	
EFF 6		.690	.810	.790	.710	.590	.500	
R 7		1.0	1.1	1.2	1.3	1.4	1.5	1.6
EFF 7		.690	.805	.845	.848	.800	.720	.580
R 9		1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8					
EFF 9		.700	.790	.835	.860	.862	.840	.760
		.620	.500					
R 10		1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8	1.9				
EFF 10		.730	.780	.830	.862	.883	.870	.835
		.760	.640	.510				
EFF 10		.750	.785	.833	.864	.882	.880	.850
		.799	.699	.570				
EFF 10		.770	.790	.838	.870	.885	.885	.860
		.810	.720	.600				
EFF 10		.780	.800	.842	.872	.887	.885	.862
		.817	.730	.599				
EFF 10		.785	.801	.847	.872	.888	.885	.860
		.818	.720	.590				
EFF 10		.780	.808	.850	.873	.883	.876	.850
		.800	.680	.560				
EFF 10		.765	.805	.848	.869	.872	.861	.825
		.745	.630	.520				
EFF 10		.747	.800	.840	.853	.852	.833	.750
		.685	.595	.480				
EFF 10		.710	.775	.810	.820	.813	.750	.685
		.610	.530	.450				
SPED 12		0.40	0.50	0.60	0.70	0.75	0.80	0.85
		0.90	0.95	1.00	1.05	1.10		
R 4		1.0	1.1	1.2	1.3			
EFF 4		.400	.451	.430	.350			
R 6		1.0	1.1	1.2	1.3	1.4	1.5	
EFF 6		.400	.449	.463	.447	.390	.300	
R 7		1.0	1.1	1.2	1.3	1.4	1.5	1.6
EFF 7		.400	.445	.472	.474	.452	.410	.355
R 8		1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7						
EFF 8		.410	.450	.470	.475	.460	.435	.398

Listing of "supersonic.maps" (Continued)

		.330						
R	9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8					
EFF	9	.415	.453	.471	.477	.460	.440	.408
		.355	.285					
EFF	9	.415	.455	.472	.478	.462	.445	.417
		.375	.310					
EFF	9	.400	.455	.469	.476	.463	.447	.423
		.385	.337					
EFF	9	.380	.452	.466	.472	.462	.449	.425
		.395	.350					
EFF	9	.370	.442	.460	.464	.460	.448	.428
		.400	.360					
R	10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8	1.9				
EFF	10	.350	.432	.450	.456	.452	.442	.423
		.398	.360	.300				
EFF	10	.350	.419	.440	.447	.443	.435	.417
		.393	.358	.300				
EFF	10	.350	.407	.428	.435	.432	.424	.407
		.380	.354	.300				
SPED	12	0.40	0.50	0.60	0.70	0.75	0.80	0.85
		0.90	0.95	1.00	1.05	1.10		
R	7	1.0	1.1	1.2	1.3	1.4	1.5	1.6
EFF	7	.435	.440	.399	.300	.250	.210	.190
R	8	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7						
EFF	8	.430	.430	.425	.398	.363	.325	.300
		.200						
R	9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8					
EFF	9	.442	.443	.439	.421	.402	.375	.350
		.285	.160					
R	10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8	1.9				
EFF	10	.451	.452	.448	.439	.420	.400	.376
		.322	.230	.130				
EFF	10	.456	.456	.451	.442	.409	.407	.385
		.337	.250	.140				
EFF	10	.460	.461	.456	.449	.435	.415	.393
		.349	.275	.165				
EFF	10	.461	.467	.460	.452	.440	.420	.400
		.356	.295	.210				
EFF	10	.462	.470	.461	.455	.442	.423	.403
		.367	.300	.235				
EFF	10	.458	.462	.460	.453	.442	.424	.405
		.375	.313	.240				
EFF	10	.448	.455	.451	.446	.436	.418	.399
		.370	.310	.245				
EFF	10	.440	.447	.446	.441	.430	.412	.396
		.365	.306	.245				
EFF	10	.440	.450	.445	.440	.418	.410	.393
		.358	.307	.250				
SPED	12	0.40	0.50	0.60	0.70	0.75	0.80	0.85
		0.90	0.95	1.00	1.05	1.10		
R	10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8	1.9				
EFF	10	.410	.400	.355	.335	.285	.260	.235
		.195	.153	.100				
EFF	10	.410	.400	.365	.342	.292	.260	.236
		.195	.152	.100				
EFF	10	.410	.400	.370	.350	.305	.260	.236

Listing of "supersonic.maps" (Continued)

		.195	.151	.100				
EFF	10	.410	.400	.373	.350	.310	.261	.236
		.195	.150	.100				
EFF	10	.410	.400	.378	.351	.310	.262	.236
		.195	.150	.100				
EFF	10	.410	.400	.382	.353	.313	.263	.236
		.195	.149	.100				
EFF	10	.410	.400	.383	.354	.315	.263	.236
		.195	.149	.100				
EFF	10	.410	.400	.385	.354	.316	.264	.237
		.195	.149	.100				
EFF	10	.411	.400	.386	.355	.318	.264	.237
		.195	.149	.100				
EFF	10	.411	.400	.387	.356	.320	.265	.237
		.195	.149	.100				
EFF	10	.411	.400	.388	.357	.322	.267	.237
		.195	.149	.100				
EFF	10	.412	.400	.389	.359	.325	.268	.238
		.195	.149	.100				
EOT								
3503		FLADE TIP	MOUNTED FAN					
ANGL	5	-5.00	0.0	50.0	65.0	85.0		
SPED	2	0.95	1.00					
R	8	1.0	1.2	1.4	1.6	1.7	1.8	1.9
		2.0						
PR	8	1.490	1.498	1.491	1.461	1.438	1.412	1.380
		1.341						
PR	8	1.580	1.585	1.570	1.520	1.478	1.451	1.415
		1.378						
SPED	12	0.40	0.50	0.60	0.70	0.75	0.80	0.85
		0.90	0.95	1.00	1.05	1.10		
R	6	1.0	1.1	1.2	1.3	1.4	1.5	
PR	6	1.080	1.075	1.065	1.052	1.037	1.013	
R	7	1.0	1.1	1.2	1.3	1.4	1.5	1.6
PR	7	1.125	1.125	1.120	1.109	1.093	1.073	1.046
R	9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8					
PR	9	1.180	1.183	1.180	1.170	1.156	1.137	1.110
		1.080	1.046					
R	10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8	1.9				
PR	10	1.252	1.255	1.252	1.242	1.228	1.206	1.176
		1.145	1.108	1.075				
PR	10	1.295	1.296	1.292	1.280	1.267	1.243	1.212
		1.180	1.138	1.100				
PR	10	1.340	1.340	1.335	1.325	1.307	1.280	1.248
		1.210	1.166	1.125				
PR	10	1.388	1.388	1.382	1.370	1.350	1.322	1.283
		1.245	1.195	1.150				
PR	10	1.440	1.440	1.430	1.415	1.392	1.362	1.320
		1.280	1.226	1.175				
PR	10	1.498	1.498	1.488	1.470	1.440	1.402	1.360
		1.315	1.260	1.210				
PR	10	1.560	1.560	1.545	1.522	1.488	1.444	1.396
		1.350	1.296	1.238				
PR	10	1.618	1.620	1.600	1.568	1.527	1.478	1.427
		1.378	1.325	1.265				
PR	10	1.665	1.672	1.642	1.600	1.553	1.500	1.450
		1.400	1.346	1.285				
SPED	12	0.40	0.50	0.60	0.70	0.75	0.80	0.85
		0.90	0.95	1.00	1.05	1.10		
R	4	1.0	1.1	1.2	1.3			

Listing of "supersonic.maps" (Continued)

PR	4	1.038	1.035	1.027	1.019			
R	6	1.0	1.1	1.2	1.3	1.4	1.5	
PR	6	1.060	1.057	1.053	1.044	1.033	1.022	
R	7	1.0	1.1	1.2	1.3	1.4	1.5	1.6
PR	7	1.085	1.083	1.077	1.068	1.058	1.046	1.036
R	8	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7						
PR	8	1.118	1.115	1.108	1.098	1.085	1.073	1.060
		1.045						
R	9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8					
PR	9	1.135	1.132	1.124	1.113	1.097	1.086	1.074
		1.057	1.042					
PR	9	1.153	1.148	1.138	1.126	1.113	1.100	1.086
		1.070	1.053					
PR	9	1.168	1.163	1.155	1.140	1.127	1.114	1.100
		1.083	1.065					
PR	9	1.184	1.180	1.169	1.155	1.140	1.127	1.113
		1.096	1.078					
PR	9	1.194	1.195	1.185	1.170	1.155	1.140	1.127
		1.108	1.090					
R	10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8	1.9				
PR	10	1.213	1.212	1.203	1.186	1.170	1.155	1.138
		1.122	1.104	1.077				
PR	10	1.227	1.228	1.218	1.200	1.184	1.168	1.152
		1.133	1.114	1.085				
PR	10	1.240	1.243	1.232	1.214	1.195	1.180	1.160
		1.143	1.123	1.094				
SPED	12	0.40	0.50	0.60	0.70	0.75	0.80	0.85
		0.90	0.95	1.00	1.05	1.10		
R	7	1.0	1.1	1.2	1.3	1.4	1.5	1.6
PR	7	1.024	1.020	1.014	1.009	1.006	1.004	1.002
R	8	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7						
PR	8	1.037	1.035	1.029	1.023	1.020	1.016	1.014
		1.005						
R	9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8					
PR	9	1.053	1.051	1.045	1.039	1.034	1.029	1.026
		1.016	1.005					
R	10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8	1.9				
PR	10	1.069	1.067	1.061	1.054	1.048	1.042	1.037
		1.027	1.015	1.004				
PR	10	1.078	1.075	1.069	1.062	1.055	1.049	1.043
		1.033	1.021	1.008				
PR	10	1.088	1.084	1.076	1.069	1.063	1.055	1.049
		1.039	1.026	1.013				
PR	10	1.099	1.093	1.085	1.078	1.070	1.062	1.055
		1.045	1.031	1.017				
PR	10	1.109	1.101	1.093	1.086	1.077	1.068	1.061
		1.050	1.036	1.022				
PR	10	1.121	1.110	1.102	1.094	1.085	1.075	1.067
		1.056	1.041	1.026				
PR	10	1.132	1.118	1.109	1.102	1.092	1.082	1.073
		1.062	1.046	1.030				
PR	10	1.144	1.126	1.117	1.110	1.099	1.088	1.078
		1.067	1.051	1.034				
PR	10	1.157	1.134	1.124	1.116	1.105	1.094	1.082
		1.071	1.054	1.038				
SPED	12	0.40	0.50	0.60	0.70	0.75	0.80	0.85

Listing of "supersonic.maps" (Continued)

		0.90	0.95	1.00	1.05	1.10		
R	10	1.0	1.1	1.2	1.3	1.4	1.5	1.6
		1.7	1.8	1.9				
PR	10	1.0036	1.0035	1.0030	1.0026	1.0021	1.0017	1.0013
		1.0009	1.0005	1.0001				
PR	10	1.0044	1.0042	1.0037	1.0033	1.0027	1.0022	1.0016
		1.0011	1.0006	1.0001				
PR	10	1.0050	1.0048	1.0044	1.0039	1.0031	1.0025	1.0020
		1.0013	1.0007	1.0001				
PR	10	1.0056	1.0053	1.0049	1.0043	1.0036	1.0028	1.0022
		1.0015	1.0008	1.0001				
PR	10	1.0058	1.0056	1.0052	1.0045	1.0038	1.0030	1.0023
		1.0016	1.0008	1.0001				
PR	10	1.0061	1.0058	1.0054	1.0047	1.0040	1.0031	1.0024
		1.0016	1.0009	1.0001				
PR	10	1.0064	1.0061	1.0057	1.0050	1.0042	1.0033	1.0025
		1.0017	1.0009	1.0001				
PR	10	1.0066	1.0063	1.0059	1.0052	1.0044	1.0034	1.0026
		1.0018	1.0009	1.0001				
PR	10	1.0070	1.0066	1.0062	1.0056	1.0047	1.0036	1.0028
		1.0019	1.0010	1.0001				
PR	10	1.0073	1.0069	1.0066	1.0058	1.0050	1.0038	1.0030
		1.0020	1.0011	1.0001				
PR	10	1.0075	1.0072	1.0068	1.0060	1.0052	1.0039	1.0031
		1.0021	1.0011	1.0001				
PR	10	1.0076	1.0072	1.0068	1.0061	1.0050	1.0039	1.0031
		1.0021	1.0011	1.0001				
EOT								
3801		HPT FLOW WITH VARIABLE AREA						0
AREA	3	0.50	1.00	1.50				
SPED	3	4523.0	5654.0	6685.0				
PR	14	1.000	1.300	1.500	1.600	1.800	2.000	2.200
		2.500	2.800	3.100	3.300	3.500	3.600	5.000
FLOW	14	0.000	7.650	8.550	8.887	9.313	9.575	9.730
		9.875	9.950	9.990	10.005	10.020	10.020	10.020
FLOW	14	0.000	7.887	8.550	8.787	9.112	9.350	9.520
		9.680	9.770	9.820	9.835	9.850	9.850	9.850
FLOW	14	0.000	8.112	8.563	8.750	9.020	9.225	9.375
		9.525	9.595	9.640	9.655	9.670	9.670	9.670
SPED	3	4523.0	5654.0	6685.0				
PR	14	1.000	1.300	1.500	1.600	1.800	2.000	2.200
		2.500	2.800	3.100	3.300	3.500	3.600	5.000
FLOW	14	0.000	15.300	17.100	17.775	18.625	19.150	19.460
		19.750	19.900	19.980	20.010	20.040	20.040	20.041
FLOW	14	0.000	15.775	17.100	17.575	18.225	18.700	19.040
		19.360	19.540	19.640	19.670	19.700	19.700	19.701
FLOW	14	0.000	16.225	17.125	17.500	18.040	18.450	18.750
		19.050	19.190	19.280	19.310	19.340	19.340	19.341
SPED	3	4523.0	5654.0	6685.0				
PR	14	1.000	1.300	1.500	1.600	1.800	2.000	2.200
		2.500	2.800	3.100	3.300	3.500	3.600	5.000
FLOW	14	0.000	22.950	25.650	26.662	27.938	28.725	29.190
		29.625	29.850	29.970	30.015	30.060	30.060	30.061
FLOW	14	0.000	23.662	25.650	26.362	27.337	28.050	28.560
		29.040	29.310	29.460	29.505	29.550	29.550	29.551
FLOW	14	0.000	24.337	25.688	26.250	27.060	27.675	28.125
		28.575	28.785	28.920	28.965	29.010	29.010	29.011
EOT								
3802		HPT EFF WITH VARIABLE AREA						0
AREA	3	0.50	1.00	1.50				
SPED	4	4000.0	5000.0	5680.0	8000.0			
PR	14	1.000	1.250	1.750	2.000	2.150	2.380	2.500

Listing of "supersonic.maps" (Continued)

		2.750	3.250	3.500	4.000	4.500	4.750	5.000
EFF	14	0.7533	0.7577	0.7661	0.7702	0.7723	0.7753	0.7771
		0.7805	0.7861	0.7884	0.7907	0.7911	0.7904	0.7893
EFF	14	0.7560	0.7645	0.7791	0.7852	0.7888	0.7925	0.7930
		0.7933	0.7937	0.7938	0.7922	0.7886	0.7860	0.7830
EFF	14	0.7560	0.7643	0.7783	0.7834	0.7861	0.7895	0.7913
		0.7940	0.7981	0.7993	0.8002	0.7989	0.7976	0.7956
EFF	14	0.7560	0.7640	0.7772	0.7819	0.7840	0.7853	0.7859
		0.7862	0.7855	0.7848	0.7834	0.7819	0.7810	0.7801
SPED	4	4000.0	5000.0	5680.0	8000.0			
PR	14	1.000	1.250	1.750	2.000	2.150	2.380	2.500
		2.750	3.250	3.500	4.000	4.500	4.750	5.000
EFF	14	0.8370	0.8419	0.8512	0.8557	0.8581	0.8615	0.8635
		0.8672	0.8734	0.8760	0.8786	0.8790	0.8782	0.8770
EFF	14	0.8400	0.8495	0.8657	0.8725	0.8765	0.8806	0.8811
		0.8815	0.8819	0.8820	0.8802	0.8762	0.8733	0.8700
EFF	14	0.8400	0.8492	0.8648	0.8705	0.8735	0.8772	0.8792
		0.8822	0.8867	0.8881	0.8891	0.8877	0.8862	0.8840
EFF	14	0.8400	0.8489	0.8636	0.8687	0.8711	0.8726	0.8732
		0.8736	0.8727	0.8720	0.8705	0.8688	0.8678	0.8668
SPED	4	4000.0	5000.0	5680.0	8000.0			
PR	14	1.000	1.250	1.750	2.000	2.150	2.380	2.500
		2.750	3.250	3.500	4.000	4.500	4.750	5.000
EFF	14	0.7533	0.7577	0.7661	0.7702	0.7723	0.7753	0.7771
		0.7805	0.7861	0.7884	0.7907	0.7911	0.7904	0.7893
EFF	14	0.7560	0.7645	0.7791	0.7852	0.7888	0.7925	0.7930
		0.7933	0.7937	0.7938	0.7922	0.7886	0.7860	0.7830
EFF	14	0.7560	0.7643	0.7783	0.7834	0.7861	0.7895	0.7913
		0.7940	0.7981	0.7993	0.8002	0.7989	0.7976	0.7956
EFF	14	0.7560	0.7640	0.7772	0.7819	0.7840	0.7853	0.7859
		0.7862	0.7855	0.7848	0.7834	0.7819	0.7810	0.7801
EOT								
3803		LPT FLOW WITH VARIABLE AREA						0
AREA	3	0.50	1.00	1.50				
SPED	3	4309.0	5244.0	6134.0				
PR	14	1.000	1.020	1.100	1.150	1.200	1.300	1.350
		1.400	1.600	1.700	1.900	2.200	2.400	2.660
FLOW	14	0.000	9.250	17.100	19.550	21.200	24.000	25.250
		26.300	29.500	30.500	31.500	32.050	32.200	32.200
FLOW	14	0.000	7.750	15.600	18.400	20.300	23.250	24.350
		25.500	28.550	29.700	30.800	31.550	31.800	31.875
FLOW	14	0.000	7.750	15.100	17.300	19.125	22.100	23.300
		24.400	27.625	28.750	30.250	31.050	31.300	31.450
SPED	3	4309.0	5244.0	6134.0				
PR	14	1.000	1.020	1.100	1.150	1.200	1.300	1.350
		1.400	1.600	1.700	1.900	2.200	2.400	2.660
FLOW	14	0.000	18.500	34.200	39.100	42.400	48.000	50.500
		52.600	59.000	61.000	63.000	64.100	64.400	64.400
FLOW	14	0.000	15.500	31.200	36.800	40.600	46.500	48.700
		51.000	57.100	59.400	61.600	63.100	63.600	63.750
FLOW	14	0.000	15.500	30.200	34.600	38.250	44.200	46.600
		48.800	55.250	57.500	60.500	62.100	62.600	62.900
SPED	3	4309.0	5244.0	6134.0				
PR	14	1.000	1.020	1.100	1.150	1.200	1.300	1.350
		1.400	1.600	1.700	1.900	2.200	2.400	2.660
FLOW	14	0.000	27.750	51.300	58.650	63.600	72.000	75.750
		78.900	88.500	91.500	94.500	96.150	96.600	96.600
FLOW	14	0.000	23.250	46.800	55.200	60.900	69.750	73.050
		76.500	85.650	89.100	92.400	94.650	95.400	95.625
FLOW	14	0.000	23.250	45.300	51.900	57.375	66.300	69.900
		73.200	82.875	86.250	90.750	93.150	93.900	94.350

Listing of "supersonic.maps" (Continued)

EOT								
3804		LPT EFF WITH VARIABLE AREA						0
AREA 3		0.50	1.00	1.50				
SPED 5		3070.0	3980.0	4470.0	4980.0	5970.0		
PR 14		1.000	1.200	1.360	1.400	1.450	1.660	1.740
		1.820	2.000	2.100	2.300	2.500	2.600	2.660
EFF 14		0.7983	0.8132	0.8221	0.8231	0.8233	0.8156	0.8107
		0.8059	0.7956	0.7893	0.7830	0.7776	0.7767	0.7758
EFF 14		0.7998	0.8071	0.8127	0.8140	0.8156	0.8210	0.8227
		0.8236	0.8236	0.8219	0.8183	0.8140	0.8119	0.8105
EFF 14		0.7929	0.8005	0.8064	0.8077	0.8095	0.8163	0.8185
		0.8204	0.8231	0.8239	0.8240	0.8225	0.8213	0.8206
EFF 14		0.7961	0.8014	0.8052	0.8064	0.8075	0.8121	0.8138
		0.8154	0.8185	0.8201	0.8225	0.8239	0.8240	0.8242
EFF 14		0.8147	0.8158	0.8164	0.8167	0.8167	0.8176	0.8178
		0.8181	0.8185	0.8190	0.8195	0.8199	0.8199	0.8200
SPED 5		3070.0	3980.0	4470.0	4980.0	5970.0		
PR 14		1.000	1.200	1.360	1.400	1.450	1.660	1.740
		1.820	2.000	2.100	2.300	2.500	2.600	2.660
EFF 14		0.8870	0.9036	0.9135	0.9145	0.9148	0.9062	0.9007
		0.8955	0.8840	0.8770	0.8700	0.8640	0.8630	0.8620
EFF 14		0.8887	0.8967	0.9030	0.9044	0.9062	0.9122	0.9141
		0.9151	0.9151	0.9132	0.9092	0.9045	0.9021	0.9006
EFF 14		0.8810	0.8895	0.8960	0.8975	0.8995	0.9070	0.9095
		0.9116	0.9146	0.9155	0.9156	0.9139	0.9126	0.9117
EFF 14		0.8846	0.8905	0.8947	0.8960	0.8972	0.9023	0.9042
		0.9060	0.9095	0.9112	0.9139	0.9154	0.9156	0.9158
EFF 14		0.9052	0.9064	0.9071	0.9074	0.9075	0.9084	0.9087
		0.9090	0.9095	0.9100	0.9105	0.9110	0.9110	0.9111
SPED 5		3070.0	3980.0	4470.0	4980.0	5970.0		
PR 14		1.000	1.200	1.360	1.400	1.450	1.660	1.740
		1.820	2.000	2.100	2.300	2.500	2.600	2.660
EFF 14		0.7983	0.8132	0.8221	0.8231	0.8233	0.8156	0.8107
		0.8059	0.7956	0.7893	0.7830	0.7776	0.7767	0.7758
EFF 14		0.7998	0.8071	0.8127	0.8140	0.8156	0.8210	0.8227
		0.8236	0.8236	0.8219	0.8183	0.8140	0.8119	0.8105
EFF 14		0.7929	0.8005	0.8064	0.8077	0.8095	0.8163	0.8185
		0.8204	0.8231	0.8239	0.8240	0.8225	0.8213	0.8206
EFF 14		0.7961	0.8014	0.8052	0.8064	0.8075	0.8121	0.8138
		0.8154	0.8185	0.8201	0.8225	0.8239	0.8240	0.8242
EFF 14		0.8147	0.8158	0.8164	0.8167	0.8167	0.8176	0.8178
		0.8181	0.8185	0.8190	0.8195	0.8199	0.8199	0.8200
EOT								
8500		INSTAL7 M=2.4 'TCB92' INLET: PT2/PT0 VS. M0						
Z 1		1.0						
Y 1		1.0						
M0 14		0.0000	0.2000	0.4000	0.6500	0.8000	1.0500	1.2000
		1.4000	1.6000	1.6010	1.8000	2.0000	2.2000	2.4000
PR 14		0.9400	0.9620	0.9700	0.9700	0.9700	0.9700	0.9550
		0.9330	0.8910	0.9318	0.9318	0.9318	0.9318	0.9318
EOT								
8501		INSTAL7 M=2.4 'TCB92' INLET: W CORR VS. M0						
Z 1		1.0						
Y 1		1.0						
M0 15		0.0000	0.2000	0.4000	0.6500	0.8000	0.9500	1.0500
		1.2000	1.4000	1.6000	1.6010	1.8000	2.0000	2.2000
		2.4000						
FLOW 15		1.5000	1.5000	1.5000	1.5000	1.5100	1.5150	1.5250
		1.5130	1.4730	1.4090	1.4320	1.3520	1.2380	1.1200
		1.0000						
EOT								

A.5 Listing of *neutral.file*

All modules in the T/BEST executive system use the neutral file to exchange information. Once a module is executed, "*neutral.file*" is updated automatically reflecting the analysis just completed. The modules NNEPWATE, BLASIM, MTSB, and FLOPS communicate indirectly with "*neutral.file*" via their input generators and post-processors while the remaining T/BEST modules directly access and update the file. The format and content of the neutral file is discussed in Section 4.0 of this manual. Also, appendix C lists in details the neutral file parameters going to or coming from a module. The neutral file obtained by executing T/BEST for the supersonic engine example discussed in this appendix is listed here.

Listing of "neutral.file"

*** TBEST EXECUTIVE SYSTEM - NEUTRAL FILE UPDATE ***

ENGINE COMPONENT TYPE: FAN	NCC	2	
NUMBER OF STAGES	NSTAGE	2	
MINIMUM CRUISE SPEED	RPMCR	0.61060E+04	
ROTOR SPEED	RPM	0.61060E+04	
MAXIMUM ROTOR SPEED	RPMAX	0.61060E+04	
BLADE TAPER RATIO (HUB/TIP)	TR	0.18000E+01	
UPSTREAM HUB RADIUS	RIUP1	0.12000E+02	(in.)
DOWNSTREAM HUB RADIUS	RIDW1	0.24000E+02	(in.)
UPSTREAM SHROUD RADIUS	ROUP1	0.31000E+02	(in.)
STAGE NUMBER	NS	1	
NUMBER OF BLADES	NB	33	
STAGE WEIGHT	NSTW	0.53000E+03	(lbs)
HUB RADIUS	RHBA	0.11770E+02	(in.)
TIP RADIUS	RTBA	0.30970E+02	(in.)
ASPECT RATIO	AR	0.30000E+01	
MAXIMUM TEMPERATURE	TMAX	0.85400E+03	(R)
BLADE ROOT ANGLE	THER	0.18435E+02	(deg.)
STAGE LENGTH	STL	0.13900E+02	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.82286E+01	(in.)
STAGE PRESSURE RATIO	PR	0.20900E+01	
STAGE PRESSURE	STAGEP	0.19720E+04	(lb/ft^2)
STAGE TEMPERATURE	STAGET	0.51900E+03	(R)
STAGE MASS FLOW RATE	STAGEF	0.69390E+03	(lb/sec)
BLADE MATERIAL	MATSLC	TITANIUM	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 FAN	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.40261E+01	(deg.)
BLADE UNCAMBER	UCAMB	-0.76460E+00	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.32700E-01	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.11305E+01	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.31400E-01	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.15116E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.15117E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.15116E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.48536E+00	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.25732E+00	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.50488E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.62866E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.70293E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.32270E+03	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.32270E+03	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.32270E+03	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.21709E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.58547E+00	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.56982E-01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.20726E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.36581E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.37537E+03	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.37538E+03	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.37537E+03	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.26885E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.84427E+00	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.22951E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.77866E-01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.26229E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.70356E+03	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.70357E+03	(cps) MODE 4

6.2

Listing of "neutral.file" (Continued)

FREQUENCY AT MAX. SPEED	WRL4	0.70356E+03	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.59135E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.24567E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.13045E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.72836E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.38269E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.71672E+03	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.71673E+03	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.71672E+03	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.60428E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.25214E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.13476E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.76070E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.40856E+00	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.99400E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE2	0.79330E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.60240E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.99400E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.79330E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.63131E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.20026E+00	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.41727E+01	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.15000E+03	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.80000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.22800E+02	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.33470E+02	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.90000E-04	(lbm.sec^2/in^4)
IMPACT MAX. EDGE STRAIN	STRAIN	0.23642E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.20000E-02	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.88460E+00	
PROFILE EFFICIENCY	EPROF	0.26100E-01	
ENDWALL EFFICIENCY	ENDWA	0.38000E-02	
SEC. LOSS EFFICIENCY	ESECL	0.30000E-03	
INCIDENCE EFFICIENCY	EINCD	0.79900E-01	
CLEARANCE EFFICIENCY	ECLEA	0.52000E-02	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.11540E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	TITANIUM	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
STAGE NUMBER	NS	2	
NUMBER OF BLADES	NB	45	
STAGE WEIGHT	NSTW	0.46000E+03	(lbs)
HUB RADIUS	RHBA	0.21100E+02	(in.)
TIP RADIUS	RTBA	0.30190E+02	(in.)
ASPECT RATIO	AR	0.20000E+01	
MAXIMUM TEMPERATURE	TMAX	0.99400E+03	(R)
BLADE ROOT ANGLE	THER	0.18435E+02	(deg.)
STAGE LENGTH	STL	0.99000E+01	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.58436E+01	(in.)
STAGE PRESSURE RATIO	PR	0.18200E+01	
STAGE PRESSURE	STAGEP	0.41215E+04	(lb/ft^2)

Listing of "neutral.file" (Continued)

STAGE TEMPERATURE	STAGET	0.65600E+03	(R)
STAGE MASS FLOW RATE	STAGEF	0.69390E+03	(lb/sec)
BLADE MATERIAL	MATSLC	TITANIUM	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 FAN	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.91650E+00	(deg.)
BLADE UNCAMBER	UCAMB	-0.28670E+00	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.81000E-02	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.13320E+00	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.41000E-02	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.27444E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.27444E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.27444E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.16967E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.34836E+00	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.10109E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.32582E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.46066E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.65426E+03	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.65427E+03	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.65426E+03	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.54290E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.22145E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.11430E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.60726E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.28581E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.80355E+03	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.80356E+03	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.80355E+03	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.68960E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.29480E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.16320E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.97401E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.57921E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.14864E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.14864E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.14864E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.13606E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.63028E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.38685E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.26514E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.19211E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.17634E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.17634E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.17634E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.16328E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.76638E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.47759E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.33319E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.24655E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.98710E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE2	0.78750E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.60260E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.98710E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.78750E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.32966E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.52601E-01	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.10012E+01	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)

Listing of "neutral.file" (Continued)

FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec ² /in ⁴)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.77940E+00	
PROFILE EFFICIENCY	EPROF	0.21100E-01	
ENDWALL EFFICIENCY	ENDWA	0.91000E-02	
SEC. LOSS EFFICIENCY	ESECL	0.10000E-03	
INCIDENCE EFFICIENCY	EINCD	0.18160E+00	
CLEARANCE EFFICIENCY	ECLEA	0.87000E-02	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.22060E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	TITANIUM	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
TOTAL WEIGHT	TWGHT	0.20121E+04	(lbs)
TOTAL COST	TCOST	0.00000E+00	(\$)
ENGINE COMPONENT TYPE: HPC	NCC	5	
NUMBER OF STAGES	NSTAGE	5	
MINIMUM CRUISE SPEED	RPMCR	0.67090E+04	
ROTOR SPEED	RPM	0.76480E+04	
MAXIMUM ROTOR SPEED	RPMAX	0.85870E+04	
BLADE TAPER RATIO (HUB/TIP)	TR	0.12000E+01	
UPSTREAM HUB RADIUS	RIUP1	0.17000E+02	(in.)
DOWNSTREAM HUB RADIUS	RIDW1	0.20000E+02	(in.)
UPSTREAM SHROUD RADIUS	ROUP1	0.22000E+02	(in.)
STAGE NUMBER	NS	1	
NUMBER OF BLADES	NB	58	
STAGE WEIGHT	NSTW	0.24600E+03	(lbs)
HUB RADIUS	RHBA	0.16660E+02	(in.)
TIP RADIUS	RTBA	0.21770E+02	(in.)
ASPECT RATIO	AR	0.20000E+01	
MAXIMUM TEMPERATURE	TMAX	0.11340E+04	(R)
BLADE ROOT ANGLE	THER	0.85308E+01	(deg.)
STAGE LENGTH	STL	0.56000E+01	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.27873E+01	(in.)
STAGE PRESSURE RATIO	PR	0.15600E+01	
STAGE PRESSURE	STAGEP	0.74200E+04	(lb/ft ²)
STAGE TEMPERATURE	STAGET	0.79300E+03	(R)
STAGE MASS FLOW RATE	STAGEF	0.44750E+03	(lb/sec)
BLADE MATERIAL	MATSLC	TITANIUM	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 FAN	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.86120E+00	(deg.)
BLADE UNCAMBER	UCAMB	-0.26930E+00	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.51000E-02	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.98000E-01	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.31000E-02	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.32793E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.36324E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.39941E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.17908E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.39540E+00	EXCIT. ORDER 2

Listing of "neutral.file" (Continued)

MAXIMUM RESONANCE MARGIN	MAXMR13	0.22409E-01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.26681E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.41345E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.76049E+03	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.77725E+03	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.79577E+03	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.45603E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.17801E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.85343E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.39007E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.11206E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.11163E+04	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3.	0.11678E+04	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.12235E+04	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.75487E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.32744E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.18496E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.11372E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.70975E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.20910E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.21193E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.21509E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.14029E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.65145E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.40097E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.27573E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.20058E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.26342E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.26840E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.27392E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.18139E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.85697E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.53798E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.37848E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.28279E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.99880E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE2	0.79720E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.60240E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.99880E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.79720E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.33815E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.51562E-01	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.22260E+00	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec^2/in^4)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.89410E+00	
PROFILE EFFICIENCY	EPROF	0.12700E-01	
ENDWALL EFFICIENCY	ENDWA	0.49000E-02	
SEC. LOSS EFFICIENCY	ESECL	0.11000E-02	
INCIDENCE EFFICIENCY	EINCD	0.67800E-01	
CLEARANCE EFFICIENCY	ECLEA	0.19300E-01	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.10590E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)

Listing of "neutral.file" (Continued)

DISK MATERIAL	DISMAT	TITANIUM	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
STAGE NUMBER	NS	2	
NUMBER OF BLADES	NB	78	
STAGE WEIGHT	NSTW	0.18500E+03	(lbs)
HUB RADIUS	RHBA	0.18230E+02	(in.)
TIP RADIUS	RTBA	0.21770E+02	(in.)
ASPECT RATIO	AR	0.18500E+01	
MAXIMUM TEMPERATURE	TMAX	0.12550E+04	(R)
BLADE ROOT ANGLE	THER	0.85308E+01	(deg.)
STAGE LENGTH	STL	0.41000E+01	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.20875E+01	(in.)
STAGE PRESSURE RATIO	PR	0.14800E+01	
STAGE PRESSURE	STAGEP	0.11575E+05	(lb/ft^2)
STAGE TEMPERATURE	STAGET	0.90800E+03	(R)
STAGE MASS FLOW RATE	STAGEF	0.44750E+03	(lb/sec)
BLADE MATERIAL	MATSLC	TITANIUM	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 FAN	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.44670E+00	(deg.)
BLADE UNCAMBER	UCAMB	-0.15680E+00	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.25000E-02	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.43600E-01	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.14000E-02	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.43538E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.47523E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.51659E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.26096E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.80478E+00	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.20319E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.26583E-01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.22127E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.10851E+04	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.11021E+04	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.11211E+04	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.68332E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.29166E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.16111E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.95829E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.56664E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.16240E+04	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.16767E+04	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.17343E+04	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.11118E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.50591E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.30394E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.20296E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.14236E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.29903E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.30193E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.30518E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.20324E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.96621E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.61081E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.43310E+01	EXCIT. ORDER 4

Listing of "neutral.file" (Continued)

MAXIMUM RESONANCE MARGIN	MAXMR45	0.32648E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.39091E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.39543E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.40049E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.26983E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.12992E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.83278E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.59959E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.45967E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.99870E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE2	0.79680E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.60280E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.99870E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.79680E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.23957E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.25518E-01	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.86540E-01	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec^2/in^4)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.85900E+00	
PROFILE EFFICIENCY	EPROF	0.17800E-01	
ENDWALL EFFICIENCY	ENDWA	0.80000E-02	
SEC. LOSS EFFICIENCY	ESECL	0.13000E-02	
INCIDENCE EFFICIENCY	EINCD	0.87200E-01	
CLEARANCE EFFICIENCY	ECLEA	0.26700E-01	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.14100E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	TITANIUM	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
STAGE NUMBER	NS	3	
NUMBER OF BLADES	NB	97	
STAGE WEIGHT	NSTW	0.14900E+03	(lbs)
HUB RADIUS	RHBA	0.19160E+02	(in.)
TIP RADIUS	RTBA	0.21770E+02	(in.)
ASPECT RATIO	AR	0.17000E+01	
MAXIMUM TEMPERATURE	TMAX	0.13760E+04	(R)
BLADE ROOT ANGLE	THER	0.85308E+01	(deg.)
STAGE LENGTH	STL	0.33000E+01	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.16749E+01	(in.)
STAGE PRESSURE RATIO	PR	0.14200E+01	
STAGE PRESSURE	STAGEP	0.17131E+05	(lb/ft^2)
STAGE TEMPERATURE	STAGET	0.10210E+04	(R)
STAGE MASS FLOW RATE	STAGEF	0.44750E+03	(lb/sec)
BLADE MATERIAL	MATSLC	TITANIUM	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 FAN	
FULL BLADE DEFINITION	ABLDEF		

Listing of "neutral.file" (Continued)

BLADE UNTWIST	UTWIST	-0.25840E+00	(deg.)
BLADE UNCAMBER	UCAMB	-0.10080E+00	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.14000E-02	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.21800E-01	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.80000E-03	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.56628E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.60892E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.65378E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.35681E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.12841E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.52271E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.14203E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	-0.12870E-01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.14684E+04	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.14854E+04	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.15045E+04	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.95124E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.42562E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.25041E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.16281E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.11025E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.22864E+04	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.23378E+04	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.23946E+04	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.15732E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.73660E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.45773E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.31830E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.23464E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.40395E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.40685E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.41010E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.27655E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.13327E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.85516E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.61637E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.47309E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.53260E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.53470E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.53706E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.36526E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.17763E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.11509E+02	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.83814E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.65051E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.25698E+01	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE2	0.79660E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.60250E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.99810E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.79660E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.17837E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.14044E-01	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.41080E-01	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec^2/in^4)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.82880E+00	
PROFILE EFFICIENCY	EPROF	0.18200E-01	

Listing of "neutral.file" (Continued)

ENDWALL EFFICIENCY	ENDWA	0.81000E-02	
SEC. LOSS EFFICIENCY	ESECL	0.21000E-02	
INCIDENCE EFFICIENCY	EINCD	0.10830E+00	
CLEARANCE EFFICIENCY	ECLEA	0.34600E-01	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.17120E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	TITANIUM	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
STAGE NUMBER	NS	4	
NUMBER OF BLADES	NB	115	
STAGE WEIGHT	NSTW	0.12700E+03	(lbs)
HUB RADIUS	RHBA	0.19740E+02	(in.)
TIP RADIUS	RTBA	0.21770E+02	(in.)
ASPECT RATIO	AR	0.15500E+01	
MAXIMUM TEMPERATURE	TMAX	0.14970E+04	(R)
BLADE ROOT ANGLE	THER	0.85308E+01	(deg.)
STAGE LENGTH	STL	0.28000E+01	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.14287E+01	(in.)
STAGE PRESSURE RATIO	PR	0.13700E+01	
STAGE PRESSURE	STAGEP	0.24326E+05	(lb/ft^2)
STAGE TEMPERATURE	STAGET	0.11330E+04	(R)
STAGE MASS FLOW RATE	STAGEF	0.44750E+03	(lb/sec)
BLADE MATERIAL	MATSLC	TITANIUM	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 FAN	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.16580E+00	(deg.)
BLADE UNCAMBER	UCAMB	-0.77700E-01	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.80000E-03	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.12300E-01	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.40000E-03	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.72628E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.76991E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.81642E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.47046E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.18523E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.90153E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.42615E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.14092E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.18981E+04	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.19152E+04	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.19343E+04	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.12515E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.57576E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.35051E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.23788E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.17031E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.31247E+04	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.31735E+04	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.32277E+04	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.21553E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.10276E+02	EXCIT. ORDER 2

Listing of "neutral.file" (Continued)

MAXIMUM RESONANCE MARGIN	MAXMR33	0.65175E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.46382E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.35105E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.52039E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.52323E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.52643E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.35783E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.17392E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.11261E+02	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.81959E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.63567E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.64251E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.64333E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.64427E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.44017E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.21508E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.14006E+02	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.10254E+02	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.80034E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	Pmode1	0.99790E+00	FINITE LIFE IF Pmode > 1.
MAX. MARGIN GOODMAN DIAG.	Pmode2	0.79660E+00	FINITE LIFE IF Pmode > 1.
MAX. MARGIN GOODMAN DIAG.	Pmode3	0.60230E+00	FINITE LIFE IF Pmode > 1.
MAX. MARGIN GOODMAN DIAG.	Pmode4	0.99790E+00	FINITE LIFE IF Pmode > 1.
MAX. MARGIN GOODMAN DIAG.	Pmode5	0.79660E+00	FINITE LIFE IF Pmode > 1.
ROOT STRESS	RSTRES	0.14236E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.89139E-02	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.23292E-01	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec^2/in^4)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.79970E+00	
PROFILE EFFICIENCY	EPROF	0.13500E-01	
ENDWALL EFFICIENCY	ENDWA	0.86000E-02	
SEC. LOSS EFFICIENCY	ESECL	0.27000E-02	
INCIDENCE EFFICIENCY	EINCD	0.13310E+00	
CLEARANCE EFFICIENCY	ECLEA	0.42400E-01	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.20030E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	TITANIUM	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
STAGE NUMBER	NS	5	
NUMBER OF BLADES	NB	128	
STAGE WEIGHT	NSTW	0.11300E+03	(lbs)
HUB RADIUS	RHBA	0.20140E+02	(in.)
TIP RADIUS	RTBA	0.21770E+02	(in.)
ASPECT RATIO	AR	0.14000E+01	
MAXIMUM TEMPERATURE	TMAX	0.16180E+04	(R)
BLADE ROOT ANGLE	THER	0.85308E+01	(deg.)
STAGE LENGTH	STL	0.25000E+01	(in.)

Listing of "neutral.file" (Continued)

BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD (1)	0.12701E+01	(in.)
STAGE PRESSURE RATIO	PR	0.13400E+01	
STAGE PRESSURE	STAGEP	0.33327E+05	(lb/ft^2)
STAGE TEMPERATURE	STAGET	0.12440E+04	(R)
STAGE MASS FLOW RATE	STAGEF	0.44750E+03	(lb/sec)
BLADE MATERIAL	MATSLC	TITANIUM	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 FAN	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.11050E+00	(deg.)
BLADE UNCAMBER	UCAMB	-0.63600E-01	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.50000E-03	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.69000E-02	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.20000E-03	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.92508E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.96832E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.10150E+04	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.60919E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.25460E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.13640E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.77298E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.41838E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.23696E+04	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.23866E+04	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.24056E+04	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.15809E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.74043E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.46028E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.32021E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.23617E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.41801E+04	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.42254E+04	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.42761E+04	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.28878E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.13939E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.89594E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.64695E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.49756E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.64872E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.65153E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.65468E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.44745E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.21872E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.14248E+02	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.10436E+02	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.81490E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.73598E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.73668E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.73746E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.50529E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.24764E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.16176E+02	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.11882E+02	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.93057E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.99700E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE2	0.79520E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.60310E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.99700E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.79520E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.11282E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.56146E-02	FAILURE IF FUNCTION > 1.

Listing of "neutral.file" (Continued)

BLADE WEIGHT	WGHT	0.14753E-01	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec ² /in ⁴)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.76580E+00	
PROFILE EFFICIENCY	EPROF	0.14000E-01	
ENDWALL EFFICIENCY	ENDWA	0.99000E-02	
SEC. LOSS EFFICIENCY	ESECL	0.40000E-02	
INCIDENCE EFFICIENCY	EINCD	0.15620E+00	
CLEARANCE EFFICIENCY	ECLEA	0.50100E-01	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.23420E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	TITANIUM	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
TOTAL WEIGHT	TWGHT	0.12505E+04	(lbs)
TOTAL COST	TCOST	0.00000E+00	(\$)
ENGINE COMPONENT TYPE: HPT	NCC	8	
NUMBER OF STAGES	NSTAGE	1	
MINIMUM CRUISE SPEED	RPMCR	0.67090E+04	
ROTOR SPEED	RPM	0.76480E+04	
MAXIMUM ROTOR SPEED	RPMAX	0.85870E+04	
BLADE TAPER RATIO (HUB/TIP)	TR	0.10000E+01	
UPSTREAM HUB RADIUS	RIUP1	0.20000E+02	(in.)
DOWNSTREAM HUB RADIUS	RIDW1	0.20000E+02	(in.)
UPSTREAM SHROUD RADIUS	ROUP1	0.22000E+02	(in.)
STAGE NUMBER	NS	1	
NUMBER OF BLADES	NB	116	
STAGE WEIGHT	NSTW	0.57000E+03	(lbs)
HUB RADIUS	RHBA	0.19900E+02	(in.)
TIP RADIUS	RTBA	0.22440E+02	(in.)
ASPECT RATIO	AR	0.20000E+01	
MAXIMUM TEMPERATURE	TMAX	0.29550E+04	(R)
BLADE ROOT ANGLE	THER	0.00000E+00	(deg.)
STAGE LENGTH	STL	0.45000E+01	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.12700E+01	(in.)
STAGE PRESSURE RATIO	PR	0.25900E+01	
STAGE PRESSURE	STAGEP	0.41786E+05	(lb/ft ²)
STAGE TEMPERATURE	STAGET	0.26964E+04	(R)
STAGE MASS FLOW RATE	STAGEF	0.38400E+03	(lb/sec)
BLADE MATERIAL	MATSLC	STAINLESS STEEL	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 TURBINE	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.20370E+00	(deg.)
BLADE UNCAMBER	UCAMB	0.30000E-02	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.14000E-02	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.24500E-01	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.90000E-03	(in.)

Listing of "neutral.file" (Continued)

FREQUENCY AT MIN. CRUISE	WMC1	0.51861E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.56606E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.61531E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.32994E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.11497E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.43312E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.74840E-01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.72393E-01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.13848E+04	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.14017E+04	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.14206E+04	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.89261E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.39630E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.23087E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.14815E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.98521E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.21170E+04	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.21797E+04	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.22486E+04	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.14711E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.68557E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.42371E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.29278E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.21423E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.42522E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.42839E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.43195E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.29182E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.14091E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.90606E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.65455E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.50364E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.51957E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.52004E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.52056E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.35373E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.17187E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.11124E+02	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.80933E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.62746E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.10000E+01	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE2	0.83920E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.54380E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.10000E+01	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.83920E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.40528E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.47423E-01	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.54960E-01	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec^2/in^4)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.74310E+00	
PROFILE EFFICIENCY	EPROF	0.15900E-01	
ENDWALL EFFICIENCY	ENDWA	0.18500E-01	
SEC. LOSS EFFICIENCY	ESECL	0.60000E-02	
INCIDENCE EFFICIENCY	EINCD	0.17090E+00	
CLEARANCE EFFICIENCY	ECLEA	0.45600E-01	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	

Listing of "neutral.file" (Continued)

SUM ROTOR EFFICIENCY	ESUMR	0.25690E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	STAINLESS STEEL	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
TOTAL WEIGHT	TWGHT	0.57000E+03	(lbs)
TOTAL COST	TCOST	0.00000E+00	(\$)
ENGINE COMPONENT TYPE: LPT	NCC	9	
NUMBER OF STAGES	NSTAGE	2	
MINIMUM CRUISE SPEED	RPMCR	0.61060E+04	
ROTOR SPEED	RPM	0.61060E+04	
MAXIMUM ROTOR SPEED	RPMAX	0.61060E+04	
BLADE TAPER RATIO (HUB/TIP)	TR	0.10000E+01	
UPSTREAM HUB RADIUS	RIUP1	0.20000E+02	(in.)
DOWNSTREAM HUB RADIUS	RIDW1	0.18000E+02	(in.)
UPSTREAM SHROUD RADIUS	ROUP1	0.24000E+02	(in.)
STAGE NUMBER	NS	1	
NUMBER OF BLADES	NB	99	
STAGE WEIGHT	NSTW	0.31000E+03	(lbs)
HUB RADIUS	RHBA	0.19900E+02	(in.)
TIP RADIUS	RTBA	0.23860E+02	(in.)
ASPECT RATIO	AR	0.25000E+01	
MAXIMUM TEMPERATURE	TMAX	0.23120E+04	(R)
BLADE ROOT ANGLE	THER	-0.87462E+01	(deg.)
STAGE LENGTH	STL	0.56000E+01	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.15840E+01	(in.)
STAGE PRESSURE RATIO	PR	0.14700E+01	
STAGE PRESSURE	STAGEP	0.16117E+05	(lb/ft^2)
STAGE TEMPERATURE	STAGET	0.21305E+04	(R)
STAGE MASS FLOW RATE	STAGEF	0.43410E+03	(lb/sec)
BLADE MATERIAL	MATSLC	STAINLESS STEEL	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 TURBINE	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.36150E+00	(deg.)
BLADE UNCAMBER	UCAMB	0.14700E-01	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.21000E-02	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.42700E-01	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.15000E-02	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.34527E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.34528E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.34527E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.23928E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.69640E+00	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.13094E+00	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.15180E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.32144E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.87355E+03	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.87356E+03	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.87355E+03	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.75839E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.32919E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.18613E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.11460E+01	EXCIT. ORDER 4

Listing of "neutral.file" (Continued)

MAXIMUM RESONANCE MARGIN	MAXMR25	0.71678E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.12057E+04	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.12058E+04	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.12057E+04	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.10848E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.49240E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.29493E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.19620E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.13696E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.26815E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.26815E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.26815E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.25350E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.12175E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.77832E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.55874E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.42699E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.27969E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.27969E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.27969E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.26483E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.12742E+02	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.81611E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.58708E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.44967E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.10000E+01	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE2	0.83960E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.54320E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.10000E+01	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.83960E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.39928E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.48663E-01	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.13242E+00	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec^2/in^4)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.89650E+00	
PROFILE EFFICIENCY	EPROF	0.25500E-01	
ENDWALL EFFICIENCY	ENDWA	0.15300E-01	
SEC. LOSS EFFICIENCY	ESECL	0.80000E-03	
INCIDENCE EFFICIENCY	EINCD	0.35300E-01	
CLEARANCE EFFICIENCY	ECLEA	0.26500E-01	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.10350E+00	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	STAINLESS STEEL	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
STAGE NUMBER	NS	2	
NUMBER OF BLADES	NB	108	
STAGE WEIGHT	NSTW	0.51000E+03	(lbs)

Listing of "neutral.file" (Continued)

HUB RADIUS	RHBA	0.19260E+02	(in.)
TIP RADIUS	RTBA	0.24500E+02	(in.)
ASPECT RATIO	AR	0.35000E+01	
MAXIMUM TEMPERATURE	TMAX	0.23120E+04	(R)
BLADE ROOT ANGLE	THER	-0.87462E+01	(deg.)
STAGE LENGTH	STL	0.52000E+01	(in.)
BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
1ST STATION CHORD LENGTH	CHORD(1)	0.14971E+01	(in.)
STAGE PRESSURE RATIO	PR	0.15200E+01	
STAGE PRESSURE	STAGEP	0.10964E+05	(lb/ft^2)
STAGE TEMPERATURE	STAGET	0.21305E+04	(R)
STAGE MASS FLOW RATE	STAGEF	0.43410E+03	(lb/sec)
BLADE MATERIAL	MATSLC	STAINLESS STEEL	
AIRFOIL DEFINITION	AIRCODE	NACA 64-206 TURBINE	
FULL BLADE DEFINITION	ABLDEF		
BLADE UNTWIST	UTWIST	-0.81030E+00	(deg.)
BLADE UNCAMBER	UCAMB	0.42000E-02	(deg.)
MAXIMUM TIP EXTENSION	TIPX	0.39000E-02	(in.)
MAX. IN PLANE Y-DISPL.	TIPY	0.14120E+00	(in.)
MAX. IN PLANE Z-DISPL.	TIPZ	0.50000E-02	(in.)
FREQUENCY AT MIN. CRUISE	WMC1	0.27800E+03	(cps) MODE 1
FREQUENCY AT ROTOR SPEED	w1	0.27801E+03	(cps) MODE 1
FREQUENCY AT MAX. SPEED	WRL1	0.27800E+03	(cps) MODE 1
MAXIMUM RESONANCE MARGIN	MAXMR11	0.17317E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR12	0.36586E+00	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR13	0.89426E-01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR14	0.31707E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR15	0.45366E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC2	0.65480E+03	(cps) MODE 2
FREQUENCY AT ROTOR SPEED	w2	0.65480E+03	(cps) MODE 2
FREQUENCY AT MAX. SPEED	WRL2	0.65480E+03	(cps) MODE 2
MAXIMUM RESONANCE MARGIN	MAXMR21	0.54343E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR22	0.22172E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR23	0.11448E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR24	0.60858E+00	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR25	0.28687E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC3	0.81938E+03	(cps) MODE 3
FREQUENCY AT ROTOR SPEED	w3	0.81940E+03	(cps) MODE 3
FREQUENCY AT MAX. SPEED	WRL3	0.81938E+03	(cps) MODE 3
MAXIMUM RESONANCE MARGIN	MAXMR31	0.70516E+01	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR32	0.30258E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR33	0.16839E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR34	0.10129E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR35	0.61031E+00	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC4	0.16339E+04	(cps) MODE 4
FREQUENCY AT ROTOR SPEED	w4	0.16339E+04	(cps) MODE 4
FREQUENCY AT MAX. SPEED	WRL4	0.16339E+04	(cps) MODE 4
MAXIMUM RESONANCE MARGIN	MAXMR41	0.15056E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR42	0.70279E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR43	0.43519E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR44	0.30140E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR45	0.22112E+01	EXCIT. ORDER 5
FREQUENCY AT MIN. CRUISE	WMC5	0.18060E+04	(cps) MODE 5
FREQUENCY AT ROTOR SPEED	w5	0.18060E+04	(cps) MODE 5
FREQUENCY AT MAX. SPEED	WRL5	0.18060E+04	(cps) MODE 5
MAXIMUM RESONANCE MARGIN	MAXMR51	0.16747E+02	EXCIT. ORDER 1
MAXIMUM RESONANCE MARGIN	MAXMR52	0.78733E+01	EXCIT. ORDER 2
MAXIMUM RESONANCE MARGIN	MAXMR53	0.49156E+01	EXCIT. ORDER 3
MAXIMUM RESONANCE MARGIN	MAXMR54	0.34367E+01	EXCIT. ORDER 4
MAXIMUM RESONANCE MARGIN	MAXMR55	0.25493E+01	EXCIT. ORDER 5
MAX. MARGIN GOODMAN DIAG.	PMODE1	0.10000E+01	FINITE LIFE IF PMODE > 1.

Listing of "neutral.file" (Continued)

MAX. MARGIN GOODMAN DIAG.	PMODE2	0.83970E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE3	0.54300E+00	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE4	0.10000E+01	FINITE LIFE IF PMODE > 1.
MAX. MARGIN GOODMAN DIAG.	PMODE5	0.83970E+00	FINITE LIFE IF PMODE > 1.
ROOT STRESS	RSTRES	0.58838E+05	(psi)
MDE BLADE ROOT RESPONSE	FROOT	0.10503E+00	FAILURE IF FUNCTION > 1.
BLADE WEIGHT	WGHT	0.15733E+00	(lbs)
FOREIGN OBJECT VELOCITY	VELFOD	0.00000E+00	(knots)
FOREIGN OBJECT RADIUS	RADFOD	0.00000E+00	(in.)
IMPACT ANGLE	ANGFOD	0.00000E+00	(deg.)
STAGGER ANGLE AT IMPACT	STAFOD	0.00000E+00	(deg.)
FOREIGN OBJECT DENSITY	DENFOD	0.00000E+00	(lbm.sec^2/in^4)
IMPACT MAX. EDGE STRAIN	STRAIN	0.00000E+00	(%)
IMPACT ROOT DAMAGE	ROOTD	0.00000E+00	FAILURE IF FUNCTION > 1.
EFFICIENCY (KINETIC)	EFNCY	0.91000E+00	
PROFILE EFFICIENCY	EPROF	0.27900E-01	
ENDWALL EFFICIENCY	ENDWA	0.16000E-01	
SEC. LOSS EFFICIENCY	ESECL	0.00000E+00	
INCIDENCE EFFICIENCY	EINCD	0.22500E-01	
CLEARANCE EFFICIENCY	ECLEA	0.23400E-01	
WINDAGE EFFICIENCY	EWIND	0.00000E+00	
SUM ROTOR EFFICIENCY	ESUMR	0.90000E-01	
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
DISK MATERIAL	DISMAT	STAINLESS STEEL	
DISK WEIGHT	DWGHT	0.00000E+00	(lbs)
PROCESS	TYPROC	MAURER	
STOCK MATERIAL WEIGHT	DSWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
TOTAL STAGE COST	COSTT	0.00000E+00	(\$)
TOTAL WEIGHT	TWGHT	0.12115E+04	(lbs)
TOTAL COST	TCOST	0.00000E+00	(\$)
ENGINE COMPONENT TYPE: INLE	NCC	1	
MATERIAL	CMPMAT	ALUMINUM	
PROCESS	TYPROC	MAURER	
INLE WEIGHT	WGHT	0.00000E+00	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.00000E+00	(in.)
OUTER RADIUS	ROUT	0.00000E+00	(in.)
COMPONENT LENGTH	LENGTH	0.00000E+00	(in.)
ENGINE COMPONENT TYPE: DUCT	NCC	4	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
DUCT WEIGHT	WGHT	0.17200E+02	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.23720E+02	(in.)
OUTER RADIUS	ROUT	0.27560E+02	(in.)
COMPONENT LENGTH	LENGTH	0.96000E+01	(in.)
ENGINE COMPONENT TYPE: DUCT	NCC	6	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
DUCT WEIGHT	WGHT	0.51000E+02	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)

Listing of "neutral.file" (Continued)

INNER RADIUS	RIN	0.20540E+02	(in.)
OUTER RADIUS	ROUT	0.21640E+02	(in.)
COMPONENT LENGTH	LENGTH	0.64000E+01	(in.)
ENGINE COMPONENT TYPE: PBUR	NCC	7	
MATERIAL	CMPMAT	NICKEL	
PROCESS	TYPROC	MAURER	
PBUR WEIGHT	WGHT	0.62030E+03	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.19510E+02	(in.)
OUTER RADIUS	ROUT	0.22560E+02	(in.)
COMPONENT LENGTH	LENGTH	0.18000E+02	(in.)
NUMBER OF NOZZLES	NCNOZZ	4	
COMBUSTOR THICKNESS	CTHK	0.10000E+00	(in.)
ENGINE COMPONENT TYPE: DUCT	NCC	10	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
DUCT WEIGHT	WGHT	0.00000E+00	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.00000E+00	(in.)
OUTER RADIUS	ROUT	0.00000E+00	(in.)
COMPONENT LENGTH	LENGTH	0.18000E+02	(in.)
ENGINE COMPONENT TYPE: FMIX	NCC	11	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
FMIX WEIGHT	WGHT	0.12360E+03	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.00000E+00	(in.)
OUTER RADIUS	ROUT	0.00000E+00	(in.)
COMPONENT LENGTH	LENGTH	0.17900E+02	(in.)
ENGINE COMPONENT TYPE: AUG	NCC	12	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
AUG WEIGHT	WGHT	0.00000E+00	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.00000E+00	(in.)
OUTER RADIUS	ROUT	0.26340E+02	(in.)
COMPONENT LENGTH	LENGTH	0.00000E+00	(in.)
ENGINE COMPONENT TYPE: NOZ	NCC	13	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
NOZ WEIGHT	WGHT	0.34220E+04	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.00000E+00	(in.)
OUTER RADIUS	ROUT	0.00000E+00	(in.)
COMPONENT LENGTH	LENGTH	0.23510E+03	(in.)
ENGINE COMPONENT TYPE: DUCT	NCC	14	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
DUCT WEIGHT	WGHT	0.15350E+03	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)

Listing of "neutral.file" (Continued)

INNER RADIUS	RIN	0.27530E+02	(in.)
OUTER RADIUS	ROUT	0.29430E+02	(in.)
COMPONENT LENGTH	LENGTH	0.72200E+02	(in.)
ENGINE COMPONENT TYPE: SHAF	NCC	17	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
SHAF WEIGHT	WGHT	0.18270E+03	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.00000E+00	(in.)
OUTER RADIUS	ROUT	0.20350E+01	(in.)
COMPONENT LENGTH	LENGTH	0.58660E+02	(in.)
SHAFT DN	DN	0.63000E+00	
ENGINE COMPONENT TYPE: SHAF	NCC	16	
MATERIAL	CMPMAT	STAINLESS STEEL	
PROCESS	TYPROC	MAURER	
SHAF WEIGHT	WGHT	0.35200E+02	(lbs)
STOCK MATERIAL WEIGHT	SWGHT	0.00000E+00	(lbs)
MAURER WEIGHT FACTOR	MAURER	0.00000E+00	(lbs)
COST TO MANUFACTURE ONE	COST1	0.00000E+00	(\$)
INNER RADIUS	RIN	0.22350E+01	(in.)
OUTER RADIUS	ROUT	0.26250E+01	(in.)
COMPONENT LENGTH	LENGTH	0.24350E+02	(in.)
SHAFT DN	DN	0.11500E+01	
GLOBAL VARIABLES 1 - AIRCRAFT	- DOC		
AIRCRAFT GROSS WEIGHT	GW	0.59696E+06	(lbs.)
AIRFRAME WEIGHT	AW	0.24832E+06	(lbs.)
CAPACITY WEIGHT	CW	0.16195E+06	(lbs.)
FUEL WEIGHT	FW	0.15659E+06	(lbs.)
CAPACITY+FUEL WEIGHT	TW	0.31854E+06	(lbs.)
WEIGHT OF BARE ENGINE	EN	0.11705E+05	(lbs.)
WEIGHT OF ENGINE ACCESSORIES	EA	0.76900E+03	(lbs.)
ESTIMATED TOTAL LENGTH	TLEN	0.36100E+03	(in.)
ESTIMATED MAXIMUM RADIUS	RADMAX	0.35200E+02	(in.)
NUMBER OF ENGINES	NE	4	
LANDING WEIGHT	WFF	0.00000E+00	(lbs.)
AIRCRAFT LIFT/DRAG RATIO	ALD	0.15810E+02	
GLOBAL VARIABLES 2 - NOISE			
1ST STAGE WEIGHT FLOW RATE	XFLOW	0.69393E+03	(lbs/sec)
1ST STAG RELATIVE TIP SPEED	XVR	0.16500E+04	(ft/sec)
1ST STAGE ROTATIVE RPM	XRPM	0.61060E+04	(RPM)
1ST STA. ROT-STAT AXIAL GAP	XGAP	0.23630E+01	(in.)
1ST ROT-STA TIP AXIAL CHORD	XCHORD	0.64000E+01	(in.)
INLET FLOW AREA	XAF	0.00000E+00	(sq. ft)
AFT DUCT AREA	XAR	0.00000E+00	(sq. ft.)
NOZZLE INNER RADIUS	RI	0.24000E+02	(ft.)
NOZZLE OUTER RADIUS	RO	0.29000E+02	(ft.)
NOZZLE (PASSAGE) HEIGHT	XAH	0.00000E+00	(in.)
TEMPERATURE	XT	0.59000E+02	(F)
RELATIVE HUMIDITY	XRH	0.70000E+02	(%)
SIDELINE DISTANCE	XDIST	0.50000E+03	(ft.)
TARGET PERCEIVED NOISE LEV.	XPNL	0.90000E+02	(PNdB)
50 DEG.PERCEIVED NOISE LEV.	XPNDBF	0.15326E+03	(PNdB)
120DEG.PERCEIVED NOISE LEV.	XPNDBR	0.16074E+03	(PNdB)
GLOBAL VARIABLES 3 - MISSION			
ALTITUDE	CALT	0.60000E+05	(ft.)
SPEED	V	0.24000E+01	(MACH No.)
GROSS THRUST	AT	0.40595E+05	(lbt)
INSTALLED THRUST	ATI	0.15428E+05	(lbt)
SPECIFIC FUEL CONSUMPT.	SFC	0.12320E+01	(lb/lbt/hr)
JET VELOCITY	XVJ	0.37708E+04	(ft/sec)

Listing of "neutral.file" (Continued)

COMPONENT TYPE: FAN	NCC	2	
STATION NUMBER AT INLET	STIDIN	2	
PRESSURE AT INLET	PFAN1	0.13697E+02	(psi.)
TEMPERATURE AT INLET	TFAN1	0.51867E+03	(R)
STATION NUMBER AT EXIT	STIDEX	3	
PRESSURE AT EXIT	PFAN2	0.52047E+02	(psi.)
TEMPERATURE AT EXIT	TFAN2	0.79317E+03	(R)
COMPONENT TYPE: HPC	NCC	5	
STATION NUMBER AT INLET	STIDIN	5	
PRESSURE AT INLET	PHPC1	0.51527E+02	(psi.)
TEMPERATURE AT INLET	THPC1	0.79317E+03	(R)
STATION NUMBER AT EXIT	STIDEX	6	
PRESSURE AT EXIT	PHPC2	0.30870E+03	(psi.)
TEMPERATURE AT EXIT	THPC2	0.13524E+04	(R)
STATION NUMBER AT EXIT	STIDEX	17	
PRESSURE AT EXIT	PHPC2	0.23706E+03	(psi.)
TEMPERATURE AT EXIT	THPC2	0.12545E+04	(R)
COMPONENT TYPE: PBUR	NCC	7	
STATION NUMBER AT INLET	STIDIN	7	
PRESSURE AT INLET	PPBUR1	0.30870E+03	(psi.)
TEMPERATURE AT INLET	TPBUR1	0.13524E+04	(R)
STATION NUMBER AT EXIT	STIDEX	8	
PRESSURE AT EXIT	PPBUR2	0.29018E+03	(psi.)
TEMPERATURE AT EXIT	TPBUR2	0.30869E+04	(R)
COMPONENT TYPE: HPT	NCC	8	
STATION NUMBER AT INLET	STIDIN	8	
PRESSURE AT INLET	PHPT1	0.29018E+03	(psi.)
TEMPERATURE AT INLET	THPT1	0.30869E+04	(R)
STATION NUMBER AT EXIT	STIDEX	9	
PRESSURE AT EXIT	PHPT2	0.11193E+03	(psi.)
TEMPERATURE AT EXIT	THPT2	0.23650E+04	(R)
STATION NUMBER AT INLET	STIDIN	17	
PRESSURE AT INLET	PHPT1	0.23706E+03	(psi.)
TEMPERATURE AT INLET	THPT1	0.12545E+04	(R)
COMPONENT TYPE: LPT	NCC	9	
STATION NUMBER AT INLET	STIDIN	9	
PRESSURE AT INLET	PLPT1	0.11193E+03	(psi.)
TEMPERATURE AT INLET	TLPT1	0.23650E+04	(R)
STATION NUMBER AT EXIT	STIDEX	10	
PRESSURE AT EXIT	PLPT2	0.50257E+02	(psi.)
TEMPERATURE AT EXIT	TLPT2	0.19360E+04	(R)
STATION NUMBER AT INLET	STIDIN	17	
PRESSURE AT INLET	PLPT1	0.23706E+03	(psi.)
TEMPERATURE AT INLET	TLPT1	0.12545E+04	(R)
COMPONENT TYPE: AUG	NCC	12	
STATION NUMBER AT INLET	STIDIN	12	
PRESSURE AT INLET	PAUG1	0.49699E+02	(psi.)
TEMPERATURE AT INLET	TAUG1	0.15536E+04	(R)
STATION NUMBER AT EXIT	STIDEX	13	
PRESSURE AT EXIT	PAUG2	0.48705E+02	(psi.)
TEMPERATURE AT EXIT	TAUG2	0.15481E+04	(R)
STATION NUMBER AT INLET	STIDIN	17	
PRESSURE AT INLET	PAUG1	0.23706E+03	(psi.)
TEMPERATURE AT INLET	TAUG1	0.12545E+04	(R)
CRUISE ALTITUDE	ALT	0.60000E+05	(ft.)
CRUISE SPEED	VC	0.24000E+01	(MACH NO.)
CRUISE SPECIFIC FUEL CONSUM	SFCC	0.12050E+01	(LB/LBT/HR)
CRUISE THRUST	ATC	0.16285E+05	(LBST)
RANGE	RANGE	0.50000E+04	(MILES)
BREGUET RANGE	BRANGE	0.70997E+04	(MILES)
TIME TO CLIMB	TC	0.50000E+00	(HOURS)
TIME TO DECEND	TD	0.50000E+00	(HOURS)

Listing of "neutral.file" (Continued)

DAY NITE FACTOR	DNF	0.12500E+01	
SPARE PARTS FACTOR	SPF	0.15000E+01	
CAPTAIN'S PAY	ODPP	0.50000E+00	(\$/HOUR)
COPilot'S PAY	ODPCP	0.25000E+00	(\$/HOUR)
FLIGHT'S ENGINEER PAY	ODPFE	0.25000E+00	(\$/HOUR)
GROSS NAT. PROD. DEF. RAT.	GNPDR	4.08122E+00	
DOMESTIC TRAVEL FACTOR	ED	0.18000E+01	(\$/HOUR)
INTERNATIONAL TAVEL FACTOR	EI	0.28000E+01	(\$/HOUR)
TRAINING FACTOR	KT	0.40000E-01	
VACATION FACTOR	KV	0.50000E-01	
CREW PREMIUM FACTOR	KP	0.50000E-01	
PAYROLL TAX FACTOR	KI	0.12000E+00	
ANNUAL FLIGHT HOURS (U.S.A)	AHD	0.80000E+03	(HOURS)
ANNUAL FLIGHT HOURS (INT.)	AHI	0.75000E+03	(HOURS)
CAPTAIN'S BASE PAY	BPP	0.36000E+04	(\$/YEAR)
1ST OFFICER'S BASE PAY	BPCP	0.32000E+04	(\$/YEAR)
FLIGHT ENGINEER'S BASE PAY	BPFE	0.34000E+04	(\$/YEAR)
FUEL COST (USA)	AFUELD	0.11000E+00	(\$/GAL)
FUEL COST (INTERNATIONAL)	AFUELI	0.14000E+00	(\$/GAL)
JET OIL COST (US)	BOILTD	0.60000E+01	(\$/GAL)
JET OIL COST (INT.)	BOILTI	0.60000E+01	(\$/GAL)
ENGINE OIL (US)	BOILRD	0.41000E+00	(\$/GAL)
ENGINE OIL (INT.)	BOILRI	0.62000E+00	(\$/GAL)
FUEL CONSUMED AT CRUISE	FCR	0.10559E+06	(LBS)
FUEL USED IN CLIMB	FCL	0.15659E+05	(LBS)
FUEL USED IN DESCENT	FD	0.15659E+05	(LBS)
FUEL FOR GROUND MANEUVERS	FGM	0.15659E+05	(LBS)
DISTANCE FOR CLIMB	DC	0.57799E+03	(MILES)
DISTANCE DESCENT	DD	0.57799E+03	(MILES)
MANEUVERING DISTANCE	DAM	0.28899E+02	(MILES)
GROUND SPEED	VG	0.26784E+04	(MPH)
COST OF COMPLETE AIRPLANE	CT	0.12916E+08	(\$)
COST OF AIRPLANE LESS ENG.	CSPA	0.10819E+08	(\$)
COST OF AIR. LESS ENG,PROP	CA	0.10819E+08	(\$)
COST OF ONE ENGINE	CE	0.52426E+06	(\$)
COST OF ONE PROP	CP	0.52426E+05	(\$)
NUMBER OF PROPS	ANP	0.00000E+00	
TIME BETWEEN ENG. OVERHAULS	HEO	0.11000E+04	(HOURS)
TAKEOFF EQUIV. HORSE POWER	ESHP	0.00000E+00	(LBS)
DENSITY OF FUEL	WF	0.65000E+01	(LBS/GAL)
DENSITY OF OIL	WO	0.81000E+01	(LBS/GAL)
INSURANCE RATE DOLLAR/VALUE	AIRA	0.40000E-01	(\$/YR, eg .04)
INSURANCE: LIABILITY&DAMAGE	PLPD	0.87000E-03	(\$/MILE)
LABOR COST	RL	0.30000E+01	(\$/HOUR)
AIRPLANE DEPRECIAT. FACTOR	AKDA	0.85000E+00	
ENGINE DEPRECIATION FACTOR	AKDE	0.85000E+00	
PROP DEPRECIATION FACTOR	AKDP	0.85000E+00	
SPARE AIRPLANE DEPRECIATION	AKDSA	0.85000E+00	
SPARE ENGINE DEPRECIATION	AKDSE	0.85000E+00	
AIRFRAME DEPRECIATION	DA	0.10000E+02	(YEARS)
ENGINE DEPRECIATION	DE	0.70000E+01	(YEARS)
PROP DEPRECIATION	DP	0.70000E+01	(YEARS)
SPARE AIRFRAME DEPRECIATION	DAS	0.10000E+02	(YEARS)
SPARE ENGINE DEPRECIATION	DES	0.10000E+02	(YEARS)
AIRPLANE SPARES/AIR. PRICE	AKSPA	0.10000E+00	
ENGINE SPARES/ENGINE PRICE	AKSPE	0.50000E+00	
BLOCK FUEL	FB	0.15659E+06	(LBS)
CAPTAIN GROSS WEIGHT FACTOR	GWFP	0.59748E+01	(\$/HR)
1ST OF. GROSS WEIGHT FACTOR	GWFCP	0.29029E+01	(\$/HR)
FLT. ENG. GROSS WT. FACTOR	GWFFE	0.30832E+01	(\$/HR)
CAPTAIN MILEAGE RATE FACTOR	XMRFP	0.29495E+02	(\$/HR)
1ST OF. MILEAGE RATE FACTOR	XMRCP	0.15492E+02	(\$/HR)

Listing of "neutral.file" (Continued)

FLT ENG MILEAGE RATE FACTOR	XMRFE	0.14196E+02	(\$/HR)
TIME TO CRUISE DOMESTIC	TGD	0.15580E+01	(HOURS)
GROUND MANUEVERING TIME	TGM	0.42945E+00	(HOURS)
DOMESTIC BLOCK TIME	TBD	0.29874E+01	(HOURS)
DOMESTIC BLOCK SPEED	VBD	0.16737E+04	(MPH)
DOM. TURBINE AIRCRAFT UTIL.	UTD	0.32328E+04	(HRS/YEAR)
DOM. RECP. ENG. AIR. UTIL.	URD	0.35370E+04	(HRS/YEAR)
INTERNATIONAL BLOCK SPEED	VBI	0.17277E+04	(MPH)
INTERNATIONAL BLOCK TIME	TBI	0.28941E+01	(HOURS)
TIME TO CRUISE INTERNAT.	TGI	0.14646E+01	(HOURS)
INT TURBINE AIR. UTILIZAION	UTI	0.32233E+04	(HRS/YEAR)
INT RECP. ENG. AIR. UTIL.	URI	0.35227E+04	(HRS/YEAR)
CAPTAINS DOMESTIC COST	CAMPD	0.43656E-01	(\$/MILE)
1S OFFICERS DOMESTIC COST	CAMCPD	0.30236E-01	(\$/MILE)
FLIGHT ENG. DOMESTIC COST	CAMFED	0.41102E-01	(\$/MILE)
DOMESTIC FUEL COST	CFTD	0.54590E+00	(\$/MILE)
DOMESTIC OIL COST	COTD	0.12217E-02	(\$/MILE)
DOMESTIC INSURANCE COSTS	CINTD	0.96357E-01	(\$/MILE)
DOM TURB AIRFR LABOR COST	ALBD	0.36255E-01	(\$/MILE)
DOM TURB AIRFR BURDEN COST	ALBDMB	0.32267E-01	(\$/MILE)
DOM REC ENG AIR LABOR COST	ALBRD	0.33855E-01	(\$/MILE)
DOM REC ENG BURDEN COST	ALBRDMB	0.30131E-01	(\$/MILE)
DOM TURB ENG LABOR MAINT.	ELBD	0.96526E-02	(\$/MILE)
DOM TURB ENG BURDEN COST	ELBDMB	0.85908E-02	(\$/MILE)
DOM TURBPROP ENG LABOR MAIN	ELBPD	0.73117E-02	(\$/MILE)
DOM TURBPROP ENG BURDEN	ELBPDMB	0.65074E-02	(\$/MILE)
DOM REC ENG. LABOR MAINT.	ELBRD	0.98969E-01	(\$/MILE)
DOM REC ENG MAINT BURDEN	ELBRDMB	0.88082E-01	(\$/MILE)
DOM TURB ENG AIR MAINT MATE	CMATD	0.54138E-01	(\$/MILE)
DOM TURB ENG AIR MAINT BURD	CMATDMB	0.12614E-01	(\$/MILE)
DOM REC ENG AIR MAINT MATE	CMARD	0.33472E-01	(\$/MILE)
DOM REC ENG AIR MAINT BURD	CMARDMB	0.77991E-02	(\$/MILE)
DOM TURB ENG MAINT MATERIAL	CMETD	0.10396E+00	(\$/MILE)
DOM TURB ENG MAINT BURDEN	CMETDMB	0.24222E-01	(\$/MILE)
DOM REC ENG MAINT MATERIALS	CMERD	0.39581E+00	(\$/MILE)
DOM REC ENG MAINT BURDEN	CMERDMB	0.92223E-01	(\$/MILE)
DOM TURB AIR APP MAINT BURD	CMBTD	0.77694E-01	(\$/MILE)
DOM REC ENG AIR APP BURDEN	CMBRD	0.21824E+00	(\$/MILE)
DOM TURBPROP AIR. APP. BURD	CMBPD	0.75611E-01	(\$/MILE)
DOM TURB AIR DEPRECIATION	CDATD	0.16997E+00	(\$/MILE)
DOM REC ENG AIRCRAFT DEPREC	CDARD	0.15535E+00	(\$/MILE)
DOM TURB ENG DEPRECIATION	CDET	0.47063E-01	(\$/MILE)
DOM. REC. ENG DEPRECIATION	CDERD	0.43016E-01	(\$/MILE)
DOM SPARE TURB AIR. DEPRECI	DSATD	0.16997E-01	(\$/MILE)
DOM SPARE REC ENG AIR DEPRE	DSARD	0.15535E-01	(\$/MILE)
DOM. SPARE TURB ENG DEPRECI	DSETD	0.35298E-01	(\$/MILE)
DOM. SPARE REC. ENG DEPRECI	DSERD	0.32262E-01	(\$/MILE)
DOM. SPARE PROP DEPRECIATIO	CDPD	0.00000E+00	(\$/MILE)
INTERNATIONAL FUEL COSTS	CFTI	0.69478E+00	(\$/MILE)
INTERNATIONAL OIL COSTS	COTI	0.11835E-02	(\$/MILE)
INTERNATIONAL INSURANCE	CINTI	0.93646E-01	(\$/MILE)
INT. TURB AIRFRAME LABOR	ALBTI	0.35123E-01	(\$/MILE)
INT. REC. ENG. AIR LABOR	ALBRI	0.32797E-01	(\$/MILE)
INT. TURB ENG LABOR MAINT	ELBTI	0.93510E-02	(\$/MILE)
INT TURBPROP ENG. LABOR MAI	ELBPI	0.70832E-02	(\$/MILE)
INT REC ENG LABOR MAINTENAN	ELBRI	0.95877E-01	(\$/MILE)
INT TURB ENG AIR MAIN MATER	CMATI	0.52446E-01	(\$/MILE)
INT REC ENG AIR MAINT MATER	CMARI	0.32427E-01	(\$/MILE)
INT TURB ENG MAINT MATERIAL	CMETI	0.10071E+00	(\$/MILE)
INT REC ENG MAINT MATERIALS	CMERI	0.38344E+00	(\$/MILE)
INT TURB AIR APP MAINT BURD	CMBTD	0.77694E-01	(\$/MILE)
INT REC ENG AIR APP BURD	CMBRD	0.21824E+00	(\$/MILE)

Listing of "neutral.file" (Continued)

INT. TURBOPROP AIR APP BURD CMBPD	0.75611E-01	(\$/MILE)
INT. TURB AIR DEPRECIATION CDATI	0.16514E+00	(\$/MILE)
INT REC ENG AIR DEPRECIATIO CDARI	0.15111E+00	(\$/MILE)
INT TURB ENG DEPRECIATION CDETI	0.45727E-01	(\$/MILE)
INT. REC. ENG DEPRECIATION CDERI	0.41841E-01	(\$/MILE)
INT. SPARE TURB. AIR DEPREC DSATI	0.16514E-01	(\$/MILE)
INT SPARE REC ENG AIR DEPR DSARI	0.15111E-01	(\$/MILE)
INT. SPARE TURB ENG DEPRECI DSETI	0.34295E-01	(\$/MILE)
INT. SPARE REC. ENG DEPRECI DSERI	0.31381E-01	(\$/MILE)
INT. SPARE PROP DEPRECIATIO CDPI	0.00000E+00	(\$/MILE)
U. S. CITY PAIRS USCITY	0.21550E+04	
WESTERN EUROPE CITY PAIRS INTCITY	0.44910E+04	
NEW JET/FAN MAIN. COST 1YR NEWT1	0.32946E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 1YR DERT1	0.36606E-01	(\$/MILE)
NEW JET/FAN MAIN. COST 2YR NEWT2	0.47588E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 2YR DERT2	0.73213E-01	(\$/MILE)
NEW JET/FAN MAIN. COST 3YR NEWT3	0.40267E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 3YR DERT3	0.10982E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 4YR NEWT4	0.32946E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 4YR DERT4	0.12812E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 5YR NEWT5	0.25624E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 5YR DERT5	0.13727E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 6YR NEWT6	0.21964E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 6YR DERT6	0.14643E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 7YR NEWT7	0.18303E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 7YR DERT7	0.15009E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 8YR NEWT8	0.16473E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 8YR DERT8	0.15009E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 9YR NEWT9	0.14643E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 9YR DERT9	0.14643E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 10YR NEWT10	0.14276E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 10YR DERT10	0.14276E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 11YR NEWT11	0.13910E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 11YR DERT11	0.13910E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 12YR NEWT12	0.13727E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 12YR DERT12	0.13727E+00	(\$/MILE)
NEW JET/FAN 8YR TOTAL NEWTJET	0.36922E+07	(\$)
DERIVATIVE JET/FAN 8YR TOTA DERTJET	0.14568E+07	(\$)
NEW TURPROP MAIN. COST 1YR NEWP1	0.31950E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 1YR DERP1	0.35500E-01	(\$/MILE)
NEW TURPROP MAIN. COST 2YR NEWP2	0.46150E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 2YR DERP2	0.71001E-01	(\$/MILE)
NEW TURPROP MAIN. COST 3YR NEWP3	0.39050E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 3YR DERP3	0.10650E+00	(\$/MILE)
NEW TURPROP MAIN. COST 4YR NEWP4	0.31950E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 4YR DERP4	0.12425E+00	(\$/MILE)
NEW TURPROP MAIN. COST 5YR NEWP5	0.24850E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 5YR DERP5	0.13313E+00	(\$/MILE)
NEW TURPROP MAIN. COST 6YR NEWP6	0.21300E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 6YR DERP6	0.14200E+00	(\$/MILE)
NEW TURPROP MAIN. COST 7YR NEWP7	0.17750E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 7YR DERP7	0.14555E+00	(\$/MILE)
NEW TURPROP MAIN. COST 8YR NEWP8	0.15975E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 8YR DERP8	0.14555E+00	(\$/MILE)
NEW TURPROP MAIN. COST 9YR NEWP9	0.14200E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 9YR DERP9	0.14200E+00	(\$/MILE)
NEW TURPROP MAIN. COST 10YR NEWP10	0.13845E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 10YR DERP10	0.13845E+00	(\$/MILE)
NEW TURPROP MAIN. COST 11YR NEWP11	0.13490E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 11YR DERP11	0.13490E+00	(\$/MILE)
NEW TURPROP MAIN. COST 12YR NEWP12	0.13313E+00	(\$/MILE)

Listing of "neutral.file" (Continued)

DERIVATIVE JET/FAN ENG 12YR	DERP12	0.13313E+00	(\$/MILE)
NEW RECIENG 8YR TOTAL	NEWPJET	0.35806E+07	(\$)
DERIVATIVE RECIENG 8YR TOTA	DERPJET	0.14128E+07	(\$)
NEW RECIENG MAIN. COST 1YR	NEWR1	0.15189E+01	(\$/MILE)
DERIVATIVE RECIENG ENG 1YR	DERR1	0.16877E+00	(\$/MILE)
NEW RECIENG MAIN. COST 2YR	NEWR2	0.21940E+01	(\$/MILE)
DERIVATIVE RECIENG ENG 2YR	DERR2	0.33754E+00	(\$/MILE)
NEW RECIENG MAIN. COST 3YR	NEWR3	0.18565E+01	(\$/MILE)
DERIVATIVE RECIENG ENG 3YR	DERR3	0.50631E+00	(\$/MILE)
NEW RECIENG MAIN. COST 4YR	NEWR4	0.15189E+01	(\$/MILE)
DERIVATIVE RECIENG ENG 4YR	DERR4	0.59070E+00	(\$/MILE)
NEW RECIENG MAIN. COST 5YR	NEWR5	0.11814E+01	(\$/MILE)
DERIVATIVE RECIENG ENG 5YR	DERR5	0.63289E+00	(\$/MILE)
NEW RECIENG MAIN. COST 6YR	NEWR6	0.10126E+01	(\$/MILE)
DERIVATIVE RECIENG ENG 6YR	DERR6	0.67508E+00	(\$/MILE)
NEW RECIENG MAIN. COST 7YR	NEWR7	0.84386E+00	(\$/MILE)
DERIVATIVE RECIENG ENG 7YR	DERR7	0.69196E+00	(\$/MILE)
NEW RECIENG MAIN. COST 8YR	NEWR8	0.75947E+00	(\$/MILE)
DERIVATIVE RECIENG ENG 8YR	DERR8	0.69196E+00	(\$/MILE)
NEW RECIENG MAIN. COST 9YR	NEWR9	0.67508E+00	(\$/MILE)
DERIVATIVE RECIENG ENG 9YR	DERR9	0.67508E+00	(\$/MILE)
NEW RECIENG MAIN. COST 10YR	NEWR10	0.65821E+00	(\$/MILE)
DERIVATIVE RECIENG ENG 10YR	DERR10	0.65821E+00	(\$/MILE)
NEW RECIENG MAIN. COST 11YR	NEWR11	0.64133E+00	(\$/MILE)
DERIVATIVE RECIENG ENG 11YR	DERR11	0.64133E+00	(\$/MILE)
NEW RECIENG MAIN. COST 12YR	NEWR12	0.63289E+00	(\$/MILE)
DERIVATIVE RECIENG ENG 12YR	DERR12	0.63289E+00	(\$/MILE)
NEW RECIENG 8YR TOTAL	NEWRENG	0.17023E+08	(\$)
DERIVATIVE RECIENG 8YR TOTA	DERRENG	0.67167E+07	(\$)
LOW PRESSURE COMPRESS PRICE	LCPRICE	0.00000E+00	(\$)
HIGH PRESSURE COMPRES PRICE	HCPRICE	0.00000E+00	(\$)
INLET PRICE	INPRICE	0.00000E+00	(\$) (NOT ACTUAL)
DUCT PRICE	DUPRICE	0.00000E+00	(\$) (NOT ACTUAL)
BURNER PRICE	BUPRICE	0.00000E+00	(\$) (NOT ACTUAL)
AUGMENTER PRICE	AUPRICE	0.00000E+00	(\$) (NOT ACTUAL)
MIXER PRICE	FMPRICE	0.00000E+00	(\$) (NOT ACTUAL)
NOZZLE PRICE	NOPRICE	0.00000E+00	(\$) (NOT ACTUAL)
SHAFT PRICE	SHPRICE	0.00000E+00	(\$) (NOT ACTUAL)
DIFFUSER PRICE	DIFPRICE	0.00000E+00	(\$)
COMBUSTOR PRICE	CBPRICE	0.00000E+00	(\$)
HIGH PRESSURE TURBINE PRICE	HTPRICE	0.00000E+00	(\$)
LOW PRESSURE TURBINE PRICE	LTPRICE	0.00000E+00	(\$)
LOW PRESSURE COMPRESS MTBR	LCMTBR	0.19691E+05	(HR)
HIGH PRESSURE COMPRES MTBR	HCMTBR	0.15765E+05	(HR)
INLET MEAN TIME REPAIR	INMTBR	0.19691E+05	(HR)
DUCT MEAN TIME REPAIR	DUMTBR	0.19691E+05	(HR)
BURNER MEAN TIME REPAIR	BUMTBR	0.61905E+04	(HR)
AUGMENTER MEAN TIME REPAIR	AUMTBR	0.61905E+04	(HR)
MIXER MEAN TIME REPAIR	FMMTBR	0.19691E+05	(HR)
NOZZLE MEAN TIME REPAIR	NOMTBR	0.19691E+05	(HR)
SHAFT MEAN TIME REPAIR	SHMTBR	0.19691E+05	(HR)
DIFFUSER MTBR	DIFMTBR	0.50000E+04	(HR)
COMBUSTOR MTBR	CBMTBR	0.61905E+04	(HR)
HIGH PRESSURE TURBINE MTBR	HTMTBR	0.56500E+04	(HR)
LOW PRESSURE TURBINE MTBR	LTMTBR	0.53961E+04	(HR)
LOW PRESSURE COMPRESS LABOR	LCHOURS	0.40915E+02	(HR)
HIGH PRESSURE COMPRES LABOR	HCHOURS	0.44059E+02	(HR)
INLET LABOR	INHOURS	0.40915E+02	(HR)
DUCT LABOR	DUHOURS	0.40915E+02	(HR)
BURNER LABOR	BUHOURS	0.25000E+03	(HR)
AUGMENTER LABOR	AUHOURS	0.25000E+03	(HR)
MIXER LABOR	FMHOURS	0.40915E+02	(HR)

Listing of "neutral.file" (Continued)

NOZZLE LABOR	NOHOURS	0.40915E+02	(HR)	
SHAFT LABOR	SHHOURS	0.40915E+02	(HR)	
DIFFUSER LABOR	DIFHOURS	0.17500E+03	(HR)	
COMBUSTOR LABOR	CBHOURS	0.25000E+03	(HR)	
HIGH PRESSURE TURBINE LABOR	HTHOURS	0.98904E+02	(HR)	
LOW PRESSURE TURBINE LABOR	LTHOURS	0.27310E+03	(HR)	
LPC MATERIALS COST	LCCOST	0.45123E-01	(\$)	
HPC MATERIALS COST	HCCOST	0.41152E-01	(\$)	
INLET MATERIALS COST	INCOST	0.45123E-01	(\$)	(NOT ACTUAL)
DUCT MATERIALS COST	DUCCOST	0.45123E-01	(\$)	(NOT ACTUAL)
BURNER MATERIALS COST	BUCOST	0.44762E-01	(\$)	(NOT ACTUAL)
AUGMENTER MATERIALS COST	AUCOST	0.44762E-01	(\$)	(NOT ACTUAL)
MIXER MATERIALS COST	FMCOST	0.45123E-01	(\$)	(NOT ACTUAL)
NOZZLE MATERIALS COST	NOCOST	0.45123E-01	(\$)	(NOT ACTUAL)
SHAFT MATERIALS COST	SHCOST	0.45123E-01	(\$)	(NOT ACTUAL)
DIFFUSER MATERIALS COST	DIFCOST	0.59202E-01	(\$)	
COMBUSTOR MATERIALS COS	CBCCOST	0.44762E-01	(\$)	
HPT MATERIALS COST	HTCCOST	0.85915E-01	(\$)	
LPT MATERIALS COST	LTCOST	0.32128E-01	(\$)	
BEGIN FLOPS DATA				
FLOPS PROGRAM CONTROL				
FLOPS PROBLEM TYPE	IOPT	1		
FLOPS ANALYSIS OPTION	IANAL	3		
FLOPS COST ANALYSIS FLAG	ICOST	1		
FLOPS GEOMETRIC, WEIGHT, BALANCE AND INERTIA DATA				
STRUCTURAL ULTIMATE LOAD	ULF	0.42200E+01	(FACTOR)	
FLOPS WING DATA				
DIHEDRAL (POSITIVE)	DIH	0.70000E+00	(deg.)	
FLOPS HORIZONTAL TAIL DATA				
AREA	SHT	0.38881E+03	(ft^2)	
1/4 CHORD SWEEP ANGLE	SWPHT	0.35000E+02	(deg.)	
ASPECT RATIO	ARHT	0.40000E+01		
TAPER RATIO	TRHT	0.40000E+00		
T/C	TCHT	0.11000E+00		
LOCATION ON VERTICAL TAIL	HHT	0.10000E+01		
FLOPS VERTICAL TAIL DATA				
NUMBER OF VERTICAL TAILS	NVERT	1		
AREA	SVT	0.39387E+03	(ft^2)	
1/4 CHORD SWEEP ANGLE	SWPVT	0.55000E+02	(deg.)	
ASPECT RATIO	ARVT	0.67000E+00		
TAPER RATIO	TRVT	0.70000E+00		
T/C	TCVT	0.12000E+00		
FLOPS FUSELAGE DATA				
NUMBER OF FUSELAGES	NFUSE	1		
TOTAL LENGTH	XL	0.15235E+03	(ft)	
MAXIMUM WIDTH	WF	0.16440E+02	(ft)	
MAXIMUM DEPTH	DF	0.17000E+02	(ft)	
CARGO AIRCRAFT FACTOR	CARGF	0.00000E+00		
PASSENGER COMPART LENGTH	XLP	0.00000E+00	(ft)	
FLOPS LANDING GEAR DATA				
LENGTH OF MAIN GEAR	XMLG	0.00000E+00	(in)	
LENGTH OF NOSE GEAR	XNLG	0.00000E+00	(in)	
CARRIER BASED AIRCRAFT	CARBAS	0.00000E+00		
FLOPS PROPULSION SYSTEM DATA				
NUMBER OF ENGINES ON WING	NEW	4		
NUMBER OF ENGINES ON FUSE	NEF	0		
BASELINE ENGINE THRUST	THRSO	0.40595E+05	(lbf)	
BASELINE ENGINE WEIGHT	WENG	0.11705E+05	(lbf)	
WEIGHT SCALING PARAMETER	EEXP	0.11500E+01		
BASELINE NACELLE LENGTH	XNAC	0.30083E+02	(ft)	
BASELINE NACELLE DIAMETER	DNAC	0.58667E+01	(ft)	
FUEL CAPACITY OF WING	FULWMX	-0.10000E+01	(lbm)	

Listing of "neutral.file" (Continued)

FUEL CAPACITY OF FUSELAGE	FULFMX	0.00000E+00	(lbm)
AUX. TANK FUEL CAPACITY	FULAUX	0.00000E+00	(lbm)
NUMBER OF FUEL TANKS	NTANK	10	
ADDED MISC PROP SYSTEM WT	WPMISC	0.00000E+00	(lbf)
FLOPS CREW AND PAYLOAD DATA			
FIRST CLASS PASSENGERS	NPF	20	
TOURIST PASSENGERS	NPT	180	
STEWARDESSES	NSTU	5	
GALLEY CREW	NGALC	0	
FLIGHT CREW	NFLCR	3	
WEIGHT PER PASSENGER	WPPASS	0.16500E+03	(lbf)
BAGGAGE PER PASSENGER	BPP	0.40000E+02	(lbf)
FLOPS OVERRIDE PARAMETERS FOR WEIGHTS (ALL SET TO TO 1.0 EXCEPT WTHR)			
THRUST REVERSERS - TOTAL	WTHR	0.36100E+04	
FLOPS CONFIGURATION GEOMETRIC RATIOS, OBJ. FUNCTION, DESIGN VARIABLES			
DESIGN RANGE	DESRNG	0.50000E+04	(n.mi)
WING LOADING REQUIRED	WSR	0.11000E+03	
THRUST/WEIGHT REQUIRED	TWR	0.50000E+00	
HORIZ TAIL VOLUME COEF	HTVC	0.10000E+01	
VERT TAIL VOLUME COEF	VTVC	0.10000E+01	
RAMP WEIGHT	GWFLOPS	0.59696E+06	(lbf)
WING ASPECT RATIO	ARFLOPS	0.50000E+01	
WING TAPER RATIO	TRFLOPS	0.08000E+00	
WING 1/4 CHORD SWEEP	SWEEP	0.31500E+02	(deg.)
WING THICKNESS-CHORD RATIO	TCA	0.06000E+00	
CRUISE MACH NUMBER	VCMN	0.24000E+01	
MAX CRUISE ALTITUDE	CH	0.60000E+05	(ft)
OBJ. FUN. WEIGHTING FACTOR	OFG	0.00000E+00	(GROSS WEIGHT)
OBJ. FUN. WEIGHTING FACTOR	OFF	0.00000E+00	(MISSION FUEL)
OBJ. FUN. WEIGHTING FACTOR	OFC	0.00000E+00	(COST)
FLOPS AERODYNAMIC OPTIONS AND APPROXIMATE TAKEOFF AND LANDING DATA			
WING TECHNOLOGY	AITEK	0.15000E+01	
FIXED DESIGN LIFT COEFFIC.	FCLDES	-0.10000E+01	
TURBULENT/LAMINAR FLOW	XLLAM	0.00000E+00	(1.0 FOR LAMINAR)
FLOPS TAKEOFF AND LANDING DATA			
MAX. LANDING/TAKEOFF WEIGHT WRATIO	WRATIO	0.81250E+00	
MAX. LANDING VELOCITY	VAPPR	0.15000E+03	(kts)
MAX. TAKEOFF FIELD LENGTH	FLTO	0.70000E+04	(ft)
MAX. LANDING FIELD LENGTH	FILDG	0.70000E+04	(ft)
MAX. CL TAKEOFF CONFIG.	CLTOM	0.20000E+01	
MAX. CL LANDING CONFIG.	CLLDM	0.30000E+01	
AIR DENSITY RATIO	DRATIO	0.10000E+01	
FLOPS ENGINE DECK CONTROL, SCALING AND USAGE DATA			
FLIGHT IDLE SWITCH	IDLE	1	
INDICATOR OF ENGINE DECK	IGENEN	-1	(-1 FOR EXTERNAL)
MIN IDLE FUEL FLOW FRACT	FIDMIN	0.80000E-01	
MAX IDLE FUEL FLOW FRACT	FIDMAX	0.10000E+01	
ENGINE DECK FILE NAME	EIFILE	nnepwate.missout	
FLOPS PERFORMANCE CONTROLS AND FACTORS AND MISSION SEGMENT DEFINITION			
PRINT MISSION CONTROL	IFLAG	1	
DETAILED MISSION PRINT	MSUMPT	1	
FLAG FOR RAMP WEIGHT ESTIM.	IRW	1	
FUEL FLOW FACTOR	FACT	0.90000E+00	
CDO FACTOR	FCDO	0.10000E+01	
CDI FACTOR	FCDI	0.10000E+01	
OWE FACTOR	OWFACT	0.10000E+01	
RANGE TOLERANCE	RTOL	0.10000E+00	(n.mi)
ATA TRAFFIC ALLOWANCE	IATA	1	
WEIGHT INCREMENT	DWT	0.10000E+01	(lbf)
FLOPS GROUND OPERATIONS AND TAKEOFF INPUT			
TAKEOFF TIME	TAKOTM	0.40000E+00	(min)
TAXI-OUT TIME	TAXOTM	0.10000E+02	(min)

Listing of "neutral.file" (Continued)

TAXI-IN TIME	TAXITM	0.10000E+02	(min)
TAKEOFF POWER SETTING	ITTF	1	
FLOPS INPUT FOR 1 CLIMB SCHEDULES			
MINIMUM CLIMB MACH NUMBER	CLMMIN	0.30000E+00	
MINIMUM CLIMB ALTITUDE	CLAMIN	0.00000E+00	(ft)
NUMBER OF CLIMB STEPS	NINCL	15	
CLIMB OPTIMIZATION FACTOR	FWF	-0.10000E+01	
FLOPS INPUT FOR 1 CRUISE SCHEDULES			
CRUISE OPTION SWITCH	IOC	1	
MINIMUM MACH NUMBER	CRMMIN	0.70000E+00	
FLOPS INPUT FOR DESCENT SCHEDULE			
MINIMUM DESCENT ALTITUDE	DEAMIN	0.00000E+00	(ft)
FLOPS RESERVE SEGMENT INPUT			
MISSED APPROACH TIME	TIMMAP	0.50000E+01	(min)
RESERVE HOLDING TIME	HOLDTM	0.30000E+02	(min)
2ND RES HOLD TIME OR FRAC	THOLD	0.50000E-01	(min)
FLOPS INPUT FOR DESCENT SCHEDULE			
NUMBER OF DESCENT STEPS	NINDE	15	
MINIMUM DESCENT MACH NO.	DEMMIN	0.30000E+00	
FLOPS COST CALCULATION DATA			
TYPE OF COST CALCULATION	ICOSTP	5	
R&D SWITCH	IRAD	1	
YEAR FOR CALCULATIONS	DYEAR	0.19870E+04	(year)
DEVELOPMENT START TIME	DEVST	0.19700E+04	(year)
FAA CERTIFICATION DATE	PLMOT	0.19800E+04	(year)
SPARES FACTOR FOR AIRFRAME	FAFMSP	0.10000E+00	
SPARES FACTOR FOR ENGINES	FENGSP	0.30000E+00	
AIRFRAME PRODUCTION QUANT.	Q	0.40000E+03	
NO OF PROTOTYPE AIRCRAFT	NPROTP	2	
NO OF FLIGHT TEST AIRCRAFT	NFLTST	2	
SPARES FACTOR FOR DEVELOP.	FPPFT	0.50000E+00	
ENGINE PRESSURE RATIO	EPR	0.24200E+02	
FLOPS ENGINE DESIGN SFC	FLSFC	0.62000E+00	(lb/hr/lb)
MAX TURBINE INLET TEMP	TEMPUR	0.22820E+04	(deg. F)
BODY TYPE SWITCH	IBODY	1	
CIRCUIT INDICATOR	ICIRC	2	
AC TOTAL PACK FLOW	AC	0.33000E+03	(lb/min)
APU FLOW RATE	APUFLW	0.38500E+03	(lb/min)
APU SHAFT HORSEPOWER	APUSHP	0.17000E+03	(hp)
HYDRAULIC PUMP FLOW RATE	HYDGPM	0.15000E+03	(gal/min)
KVA RATING OF FULLTIME GENS	KVA	0.30000E+03	(kva)
NO OF APUS	NAPU	1	
NO OF AUTOPILOT CHANNELS	NCHAN	2	
NO OF INFLIGHTOPERATED GENS	NGEN	4	
MANUFACTURERS PROFIT RATE	PRORAT	0.15000E+02	(%)
DEPRECIATION PERIOD	DEPPER	0.14000E+02	(years)
FARE	FARE	0.09450E+00	(\$/pass/mile)
FUEL PRICE	FUELPR	0.50000E+00	(\$/gal)
TAX RATE FOR ROI CALCUL.	TAXRAT	0.33000E+00	
NO OF PODDED ENGINES	NPOD	2	
DIRECT LABOR BURDEN FACTOR	DLBUR	0.20000E+01	
NO OF YEARS FOR LCC CALCUL.	LIFE	0.14000E+02	(years)
RESIDUAL AT END OF DEPPER	RESID	0.15000E+02	(%)
RETURN ON INVESTMENT	ROI	0.70000E+01	(%)
LOAD FACTOR	LF	0.55000E+02	(%)
% OF SEATS FOR 1ST CLASS	PCTFC	0.10000E+02	(%)
MULTIPLEX INDICATOR	IMUX	1	(YES=0, NO=1)
AUXILIARY POWER INDICATOR	ISPOOL	1	(SINGLE=0, DOUBLE=1)
FLOPS MISSION SUMMARY			
TAXI OUT INITIAL WEIGHT	WTAXOUT	0.13233E+07	(lb)
TAXI OUT FUEL REQUIRED	FTAXOUT	0.59610E+04	(lb)
TAKE OFF INITIAL WEIGHT	WTAXOFF	0.13174E+07	(lb)

Listing of "neutral.file" (Continued)

TAXI OFF FUEL REQUIRED	FTAXOFF	0.29810E+04	(lb)
CLIMB INITIAL WEIGHT	WTCLIMB	0.13144E+07	(lb)
CLIMB FUEL REQUIRED	FLCLIMB	0.75417E+05	(lb)
CRUISE INITIAL WEIGHT	WTCRUIS	0.12390E+07	(lb)
CRUISE FUEL REQUIRED	FLCRUIS	0.61454E+06	(lb)
DESCENT INITIAL WEIGHT	WTDESCE	0.62444E+06	(lb)
DESCENT FUEL REQUIRED	FLDESCE	0.12255E+05	(lb)
ZERO FUEL INITIAL WEIGHT	WTZEROF	0.58132E+06	(lb)
TOTAL DESIGN RANGE	DERNMI	0.52603E+04	(n.mi)
TOTAL FLIGHT TIME	TOTTIME	0.25850E+03	(min)
TOTAL NITROGEN OXIDES EMISS	TOTNITR	0.00000E+00	(lb)
FLOPS SEGMENT 1 CLIMB DETAILED FLIGHT DATA			
TIME SINCE TAKEOFF	TIME1	0.10400E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.00000E+00	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.30000E+00	
DISTANCE TRAVELED SOFAR	DIST1	0.00000E+00	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.13144E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELTI1	0.89420E+04	(lb)
CURRENT ENGINE THRUST	THRSTI1	0.56446E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.91861E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.51852E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.11150E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.33330E+04	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.40090E+00	
DISTANCE TRAVELED SOFAR	DIST1	0.28000E+01	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.13088E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELTI1	0.14533E+05	(lb)
CURRENT ENGINE THRUST	THRSTI1	0.50923E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.94169E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.47954E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.11620E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.66670E+04	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.42560E+00	
DISTANCE TRAVELED SOFAR	DIST1	0.49000E+01	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.13056E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELTI1	0.17728E+05	(lb)
CURRENT ENGINE THRUST	THRSTI1	0.45500E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.92373E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.42030E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.12150E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.10000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.45220E+00	
DISTANCE TRAVELED SOFAR	DIST1	0.73000E+01	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.13025E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELTI1	0.20856E+05	(lb)
CURRENT ENGINE THRUST	THRSTI1	0.39938E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.90186E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.36019E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.13020E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.11011E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.86920E+00	
DISTANCE TRAVELED SOFAR	DIST1	0.13400E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12967E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELTI1	0.26612E+05	(lb)
CURRENT ENGINE THRUST	THRSTI1	0.52307E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.10101E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.52832E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.13770E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.22952E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.87310E+00	
DISTANCE TRAVELED SOFAR	DIST1	0.19900E+02	(n.mi)

Listing of "neutral.file" (Continued)

CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12920E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.31361E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.32676E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.96330E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.31477E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.14610E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.19285E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.12665E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.29000E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12865E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.36861E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.52238E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.10764E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.56231E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.15240E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.20461E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.14833E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.37900E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12807E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.42657E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.57783E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.11347E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.65565E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.15740E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.23737E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.16512E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.45900E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12754E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.47898E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.64706E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.11410E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.73831E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.16170E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.28167E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.18000E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.53200E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12708E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.52532E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.62549E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.11329E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.70861E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.16620E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.33796E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.19375E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.61400E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12663E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.57010E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.53250E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.11538E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.61441E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.17130E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.37748E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.20756E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.71200E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12618E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.61548E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.48485E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.11747E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.56956E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.17710E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.41870E+05	(ft)

Listing of "neutral.file" (Continued)

CURRENT SPEED (MACH NUMBER)	TIMACH1	0.21840E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.83100E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12571E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.66222E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.41840E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.11920E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.49872E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.18410E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.43898E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.23185E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.98000E+02	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12521E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.71264E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.38936E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.12133E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.47241E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.19270E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.49150E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.11750E+03	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12464E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.76911E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.32196E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.12267E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.39496E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME1	0.20790E+02	(min)
CURRENT ALTITUDE	ALTIME1	0.58049E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH1	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST1	0.15220E+03	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME1	0.12390E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT11	0.84359E+05	(lb)
CURRENT ENGINE THRUST	THRST11	0.21209E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL1	0.12303E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL1	0.26093E+06	(lb/hr)
FLOPS SEGMENT 2 CRUISE DETAILED FLIGHT DATA			
TIME SINCE TAKEOFF	TIME2	0.20790E+02	(min)
CURRENT ALTITUDE	ALTIME2	0.58049E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.15220E+03	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.12390E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.84359E+05	(lb)
CURRENT ENGINE THRUST	THRST12	0.20074E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11066E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.22214E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.31460E+02	(min)
CURRENT ALTITUDE	ALTIME2	0.58653E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.39710E+03	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.12000E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.12334E+06	(lb)
CURRENT ENGINE THRUST	THRST12	0.19469E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11071E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.21553E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.45660E+02	(min)
CURRENT ALTITUDE	ALTIME2	0.59426E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.72280E+03	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.11500E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.17334E+06	(lb)

Listing of "neutral.file" (Continued)

CURRENT ENGINE THRUST	THRSTI2	0.18695E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11077E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.20708E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.60450E+02	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.10621E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.11000E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.22334E+06	(lb)
CURRENT ENGINE THRUST	THRSTI2	0.17937E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11078E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.19871E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.75850E+02	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.14156E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.10500E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.27334E+06	(lb)
CURRENT ENGINE THRUST	THRSTI2	0.17247E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11064E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.19083E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.91890E+02	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.17834E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.10000E+07	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.32334E+06	(lb)
CURRENT ENGINE THRUST	THRSTI2	0.16599E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11051E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.18343E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.10856E+03	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.21659E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.95000E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.37334E+06	(lb)
CURRENT ENGINE THRUST	THRSTI2	0.15992E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11036E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.17649E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.12586E+03	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.25628E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.90000E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.42334E+06	(lb)
CURRENT ENGINE THRUST	THRSTI2	0.15426E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11048E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.17042E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.14376E+03	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.29734E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.85000E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.47334E+06	(lb)
CURRENT ENGINE THRUST	THRSTI2	0.14902E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11060E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.16481E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.16225E+03	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.33978E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.80000E+06	(lb)

Listing of "neutral.file" (Continued)

AMOUNT OF FUEL CONSUMED	FUELT12	0.52334E+06	(lb)
CURRENT ENGINE THRUST	THRST12	0.14413E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11072E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.15958E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.18134E+03	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.38357E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.75000E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.57334E+06	(lb)
CURRENT ENGINE THRUST	THRST12	0.13967E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11084E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.15480E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.20099E+03	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.42866E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.70000E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.62334E+06	(lb)
CURRENT ENGINE THRUST	THRST12	0.13564E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11095E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.15050E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.22118E+03	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.47498E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.65000E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.67334E+06	(lb)
CURRENT ENGINE THRUST	THRST12	0.13206E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11110E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.14671E+06	(lb/hr)
TIME SINCE TAKEOFF	TIME2	0.23170E+03	(min)
CURRENT ALTITUDE	ALTIME2	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH2	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST2	0.49911E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME2	0.62444E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT12	0.69890E+06	(lb)
CURRENT ENGINE THRUST	THRST12	0.13040E+06	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL2	0.11117E+01	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL2	0.14496E+06	(lb/hr)
FLOPS SEGMENT 3 DESCENT DETAILED FLIGHT DATA			
TIME SINCE TAKEOFF	TIME3	0.23170E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.24000E+01	
DISTANCE TRAVELED SOFAR	DIST3	0.49911E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62444E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.69890E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.18869E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.23210E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.22394E+01	
DISTANCE TRAVELED SOFAR	DIST3	0.50000E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62433E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.69901E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.17446E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.23257E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.20664E+01	

Listing of "neutral.file" (Continued)

DISTANCE TRAVELED SOFAR	DIST3	0.50097E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62421E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.69913E+06	(lb)
CURRENT ENGINE THRUST	THRSTI3	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.15885E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.23314E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.18775E+01	
DISTANCE TRAVELED SOFAR	DIST3	0.50204E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62408E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.69926E+06	(lb)
CURRENT ENGINE THRUST	THRSTI3	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.14056E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.23384E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.16674E+01	
DISTANCE TRAVELED SOFAR	DIST3	0.50322E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62395E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.69939E+06	(lb)
CURRENT ENGINE THRUST	THRSTI3	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.11422E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.23471E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.59344E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.14423E+01	
DISTANCE TRAVELED SOFAR	DIST3	0.50452E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62380E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.69954E+06	(lb)
CURRENT ENGINE THRUST	THRSTI3	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.11230E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.23584E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.60000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.11358E+01	
DISTANCE TRAVELED SOFAR	DIST3	0.50591E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62359E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.69975E+06	(lb)
CURRENT ENGINE THRUST	THRSTI3	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.14280E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.23738E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.54794E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.95000E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.50745E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62328E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.70005E+06	(lb)
CURRENT ENGINE THRUST	THRSTI3	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.11774E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.23975E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.46558E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.85040E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.50948E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62285E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.70048E+06	(lb)
CURRENT ENGINE THRUST	THRSTI3	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.12495E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.24344E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.37054E+05	(ft)

Listing of "neutral.file" (Continued)

CURRENT SPEED (MACH NUMBER)	TIMACH3	0.79410E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.51238E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62211E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.70123E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.14323E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.24808E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.28661E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.65760E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.51564E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.62091E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.70242E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.20072E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.25370E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.19829E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.53060E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.51899E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.61923E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.70410E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.19761E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.26032E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.10000E+05	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.45220E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.52238E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.61683E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.70651E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.28815E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.26277E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.66670E+04	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.42560E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.52353E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.61568E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.70766E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.33624E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.26532E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.33330E+04	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.40090E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.52467E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.61430E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.70904E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.38363E+05	(lb/hr)
TIME SINCE TAKEOFF	TIME3	0.26885E+03	(min)
CURRENT ALTITUDE	ALTIME3	0.00000E+00	(ft)
CURRENT SPEED (MACH NUMBER)	TIMACH3	0.30000E+00	
DISTANCE TRAVELED SOFAR	DIST3	0.52603E+04	(n.mi)
CURRENT AIRCRAFT GROSS WGHT	GWTIME3	0.61218E+06	(lb)
AMOUNT OF FUEL CONSUMED	FUELT13	0.71116E+06	(lb)
CURRENT ENGINE THRUST	THRST13	0.00000E+00	(lbst)
FLOPS SPECIFIC FUEL CONSUM.	SFCFL3	0.00000E+00	(lb/lbt/hr)
CURRENT FUEL FLOW RATE	FLOWFL3	0.41482E+05	(lb/hr)

FLOPS AERO AND MISSION ANALYSIS SUMMARY

Listing of "neutral.file" (Continued)

FLOPS AIRCRAFT GROSS WEIGHT	GWFLTO	0.13233E+07	(lb)
FLOPS DESIGN MACH NUMBER	DESMAC	0.24000E+01	
FLOPS CRUISE VELOCITY	VFLOPS	0.15840E+04	(mi/hr)
FLOPS MAX. DYNAMIC PRESSURE	PRESSF	0.11040E+04	(psf)
FLOPS TOTAL RANGE	RGFLTO	0.57539E+04	(mi)
FLOPS BLOCK TIME	BTIMFL	0.46500E+01	(hr)
FLOPS BLOCK FUEL	BFUELF	0.71712E+06	(lb)
FLOPS AIRCRAFT COST ANALYSIS SUMMARY			
FLOPS WING WEIGHT	WINWGFL	0.15655E+06	(lb)
FLOPS WING COST	WINCOFL	0.94300E+07	(\$)
FLOPS TAIL WEIGHT	TAIWGFL	0.15068E+05	(lb)
FLOPS TAIL COST	TAICOFL	0.16510E+07	(\$)
FLOPS FUSELAGE WEIGHT	FUSWGFL	0.30911E+05	(lb)
FLOPS FUSELAGE COST	FUSCOFL	0.32410E+07	(\$)
FLOPS LANDING GEAR WEIGHT	LANWGFL	0.48569E+05	(lb)
FLOPS LANDING GEAR COST	LANCOFL	0.34590E+07	(\$)
FLOPS NACELLE WEIGHT	NACWGFL	0.37547E+05	(lb)
FLOPS NACELLE COST	NACCOFL	0.48570E+07	(\$)
FLOPS THRUST REVERSER WGHT	THRWGFL	0.36100E+04	(lb)
FLOPS THRUST REVERSER COST	THRCOFL	0.85000E+06	(\$)
FLOPS SURFACE CONTROL WGHT	SURWGFL	0.19435E+05	(lb)
FLOPS SURFACE CONTROL COST	SURCOFL	0.49180E+07	(\$)
FLOPS AUX POWER UNIT WEIGHT	AUXWGFL	0.12010E+04	(lb)
FLOPS AUX POWER UNIT COST	AUXCOFL	0.36000E+06	(\$)
FLOPS INSTRUMENTS WEIGHT	INSWGFL	0.13840E+04	(lb)
FLOPS INSTRUMENTS COST	INSCOFL	0.13560E+07	(\$)
FLOPS HYDRAULICS WEIGHT	HYDWGFL	0.33930E+04	(lb)
FLOPS HYDRAULICS COST	HYDCOFL	0.22800E+06	(\$)
FLOPS ELECTRICAL WEIGHT	ELEWGFL	0.37890E+04	(lb)
FLOPS ELECTRICAL COST	ELECOFL	0.83300E+06	(\$)
FLOPS AVIONICS WEIGHT	AVIWGFL	0.23120E+04	(lb)
FLOPS AVIONICS COST	AVICOFL	0.22650E+07	(\$)
FLOPS FURNISHING WEIGHT	FURWGFL	0.20403E+05	(lb)
FLOPS FURNISHING COST	FURCOFL	0.25690E+07	(\$)
FLOPS AIR CONDITION. WEIGHT	AIRWGFL	0.65300E+04	(lb)
FLOPS AIR CONDITION. COST	AIRCOFL	0.18860E+07	(\$)
FLOPS ANTI-ICING WEIGHT	ICEWGFL	0.43300E+03	(lb)
FLOPS ANTI-ICING COST	ICECOFL	0.12300E+06	(\$)
FLOPS PNEUMATIC WEIGHT	PNEWGFL	0.84800E+03	(lb)
FLOPS PNEUMATIC COST	PNECOFL	0.15800E+06	(\$)
FLOPS EMPTY WEIGHT	EMPWGFL	0.35967E+06	(lb) (LESS BARE ENGINES)
FLOPS TOTAL AIRFRAME COST	AIRTCOS	0.48885E+08	(\$)
FLOPS AIRFRAME R&D COST	RADCOST	0.26797E+10	(\$)
FLOPS DIRECT OPERATING COST FOR MATERIAL AND LABOR			
AIRFRAME INSPECT.MATERIAL	AIRMAT	0.35770E+02	(\$/departure)
AIRFRAME INSPECT.LABOR	AIRLAB	0.21862E+03	(\$/departure)
AIR CONDITIONING MATERIAL	ACMAT	0.13190E+02	(\$/departure)
AIR CONDITIONING LABOR	ACLAB	0.14410E+02	(\$/departure)
AUTOPILOT MATERIAL COST	AUTMAT	0.47600E+01	(\$/departure)
AUTOPILOT LABOR COST	AUTLAB	0.14940E+02	(\$/departure)
COMMUNICATIONS MATERIAL	COMMAT	0.80700E+01	(\$/departure)
COMMUNICATIONS LABOR COST	COMLAB	0.18870E+02	(\$/departure)
ELECTRICAL POWER MATERIAL	ELEMAT	0.29210E+02	(\$/departure)
ELECTRICAL POWER LABOR COST	ELELAB	0.21310E+02	(\$/departure)
EQUIPMENT & FURNISHINGS MAT	EQUMAT	0.29130E+02	(\$/departure)
EQUIPMENT & FURNISHINGS LAB	EQULAB	0.59870E+02	(\$/departure)
FIRE PROTECTION MATERIAL	FIRMAT	0.50700E+01	(\$/departure)
FIRE PROTECTION LABOR	FIRLAB	0.55700E+01	(\$/departure)
FLIGHT CONTROLS MATERIAL	FLIMAT	0.27020E+02	(\$/departure)
FLIGHT CONTROLS LABOR	FLILAB	0.30940E+02	(\$/departure)
FUEL MATERIAL	FUEMAT	0.11060E+02	(\$/departure)
FUEL LABOR	FUELAB	0.23000E+02	(\$/departure)

Listing of "neutral.file" (Continued)

HYDRAULIC POWER MATERIAL	HYDMAT	0.21080E+02	(\$/departure)
HYDRAULIC POWER LABOR	HYDLAB	0.14670E+02	(\$/departure)
ICE AND RAIN PROTECTION MAT	ICEMAT	0.74300E+01	(\$/departure)
ICE AND RAIN PROTECTION LAB	ICELAB	0.41500E+01	(\$/departure)
INSTRUMENTS MATERIAL	INSMAT	0.22400E+01	(\$/departure)
INSTRUMENTS LABOR	INSLAB	0.59000E+01	(\$/departure)
LANDING GEAR MATERIAL	LANMAT	0.29580E+03	(\$/departure)
LANDING GEAR LABOR	LANLAB	0.12289E+03	(\$/departure)
LIGHTING MATERIAL	LIGMAT	0.63200E+01	(\$/departure)
LIGHTING LABOR	LIGLAB	0.10440E+02	(\$/departure)
NAVIGATION MATERIAL	NAVMAT	0.12900E+02	(\$/departure)
NAVIGATION LABOR	NAVLAB	0.22360E+02	(\$/departure)
OXYGEN MATERIAL	OXYMAT	0.30100E+01	(\$/departure)
OXYGEN LABOR	OXYLAB	0.34400E+01	(\$/departure)
PNEUMATICS MATERIAL	PNEMAT	0.18180E+02	(\$/departure)
PNEUMATICS GEAR LABOR	PNELAB	0.33800E+01	(\$/departure)
WATER/WASTE MATERIAL COST	WATMAT	0.28500E+01	(\$/departure)
WATER/WASTE LABOR COST	WATLAB	0.23500E+01	(\$/departure)
AIRBORNE AUXIL. POWER MAT.	AUXMAT	0.24850E+02	(\$/departure)
AIRBORNE AUXIL. POWER LABOR	AUXLAB	0.20020E+02	(\$/departure)
STRUCTURES MATERIAL COST	STRMAT	0.00000E+00	(\$/departure)
STRUCTURES LABOR COST	STRLAB	0.16130E+02	(\$/departure)
DOORS MATERIAL COST	DORMAT	0.63300E+01	(\$/departure)
DOORS LABOR COST	DORLAB	0.75900E+01	(\$/departure)
FUSELAGE MATERIAL COST	FUSMAT	0.18800E+01	(\$/departure)
FUSELAGE LABOR COST	FUSLAB	0.24970E+02	(\$/departure)
NACELLES MATERIAL COST	NACMAT	0.99000E+00	(\$/departure)
NACELLES LABOR COST	NACLAB	0.23900E+01	(\$/departure)
STABILIZERS MATERIAL COST	STAMAT	0.12000E+01	(\$/departure)
STABILIZERS LABOR COST	STALAB	0.26700E+01	(\$/departure)
WINDOWS MATERIAL COST	WINMAT	0.20200E+02	(\$/departure)
WINDOWS LABOR COST	WINLAB	0.30200E+01	(\$/departure)
WINGS MATERIAL COST	WIGMAT	0.14210E+02	(\$/departure)
WINGS LABOR COST	WIGLAB	0.94500E+01	(\$/departure)
AIRFRAME MAINTENANCE MAT.	AFRMAT	0.60274E+03	(\$/departure)
AIRFRAME MAINTENANCE LABOR	AFRLAB	0.68336E+03	(\$/departure)
PROPULSION SYSTEM MAINT.MAT	PROMAT	0.47004E+03	(\$/departure)
PROPULSION SYSTEM MAINT.LAB	PROLAB	0.42236E+03	(\$/departure)
MATERIAL COST SUBTOTAL	SUBMAT	0.24829E+04	(\$/departure)
DIRECT LABOR SUBTOTAL	SUBLAB	0.23728E+04	(\$/departure)
MAINTENANCE LABOR BURDEN	BURLAB	0.33219E+05	(\$/departure)
TOTAL MAINTENANCE/DEPARTURE	MAICOS	0.38075E+05	(\$/departure)
FLOPS REMAINING DIRECT OPERATING COST ELEMENT			
DEPRECIATION COST	DEPCOS	0.86438E+04	(\$/departure)
INSURANCE COST	RCECOS	0.98904E+03	(\$/departure)
AIRCRAFT SERVICING COST	SERCOS	0.18789E+04	(\$/departure)
FLIGHT CREW COST	CRECOS	0.43538E+04	(\$/departure)
FUEL COST	FUECOS	0.53199E+05	(\$/departure)
LIFETIME DOC COST	LIFCOS	0.96638E+09	(\$)
FLOPS INDIRECT OPERATING COST			
GROUND PROPERTY/EQUIP. COST	GROCOS	0.59668E+04	(\$/departure)
CABIN CREW EXPENSES COST	CABCOS	0.16442E+04	(\$/departure)
PASSENGER FOOD & BEVERAGE	FABCOS	0.10718E+04	(\$/departure)
PASS. SERVICE SUPPORT COST	SUPCOS	0.88949E+04	(\$/departure)
AIRCRAFT CONTROL COST	CONCOS	0.67340E+02	(\$/departure)
PASSENGER HANDLING, RESERV.	HANCOS	0.14203E+04	(\$/departure)
BAGGAGE HANDLING COST	BAGCOS	0.38841E+03	(\$/departure)
CARGO HANDLING COST	CARCOS	0.00000E+00	(\$/departure)
FREIGHT SALES COST	SALCOS	0.00000E+00	(\$/departure)
GENERAL/ADMINISTRATIVE COST	ADMCOS	0.17703E+04	(\$/departure)
TOTAL INDIRECT OPERATING	INDCOS	0.21224E+05	(\$/departure)
FLOPS MISC. COST/PROFIT ELEMENTS			

Listing of "neutral.file" (Continued)

FLOPS MANUFACTURING COST	MANCOS	0.70421E+08	(\$)
AIRFRAME SPARES COST	SPACOS	0.48880E+07	(\$)
ENGINES SPARES COST	SPECOS	0.44510E+07	(\$)
MANUFACTURERS PROFIT	MANPRO	0.11964E+08	(\$)
TOTAL ACQUISITION COST	ACQCOS	0.91725E+08	(\$)
TOTAL LIFE DOC	DOCLIF	0.96638E+09	(\$)
TOTAL LIFE INDIRECT OC	IOCLIF	0.19144E+09	(\$)
TOTAL LIFE CYCLE COST	CYCCOS	0.11578E+10	(\$)
TOTAL LIFE OPERATING COST	OPECOS	0.10799E+10	(\$)
RETURN ON INVESTMENT	ROIPER	0.70000E+01	(%)
FARE COST	FARCOS	0.12577E+04	(\$/pass)
END FLOPS DATA			

APPENDIX B

DESCRIPTION OF AIRFOIL DATA BANK

B.1 Airfoil Data Bank

The airfoil data bank file is named *airfoil.bank* and resides under the *tbest* directory. This file is required prior to the execution of T/BEST because the BLASIM and MTSB modules employ blade geometry for structural and transonic flow analyses. The BLASIM module provides the T/BEST neutral file with structural response parameters of the blade of rotating components. The MTSB module calculates the flow solution for the hub-shroud mid channel stream surface. General data about the blade such as: aspect ratio, and hub and tip radii are obtained from the NNEPWATE module. The input files to BLASIM and MTSB are generated by BLASIMGEN and MTSBGEN respectively.

The *airfoil.bank* file permits the construction of the blade according to the user's specification. It can accept both airfoil definition as well as the full blade geometry (detailed airfoil). In this appendix, the data and format required to define a specific airfoil or a blade are described.

The user can build-up a library of airfoils in the data bank file to construct fan, compressor and turbine blades at each stage. In the T/BEST neutral file, one of two keywords, AIRCODE or ABLDEF, can be used for the definition of the blade geometry. Unless specified by the user, T/BEST uses a default airfoil "NACA 64-206 FAN" for fans/compressors and "NACA 64-206 TURBINE" for turbines. These selections may be modified as it demonstrated in section 3.3. The AIRCODE keyword is used to define a single basic airfoil for the construction of the whole blade while the ABLDEF keyword is used to define airfoils at all stations across the span of the blade. ABLDEF is left blank by default but when updated, T/BEST utilizes the full geometry for blade definition.

The airfoil data bank discussed here contains three set of NACA airfoils. Each set consists of two airfoils: the first for fans or compressors and the second for turbines. The three sets are: NACA 63A210, NACA 64-206, and NACA 66-206. Figure B.1 shows a plot of the airfoils used in the data bank. Note that these airfoils are used here for demonstration purposes. Also, the airfoil data bank file accepts full blade geometry (detailed airfoils at all stations). Figure B.2 shows the SR2 blade included in *airfoil.bank* which consists of 5 stations. The neck of the blade extends from the first to the second station. The airfoil input description is consistent with the one used in industry.

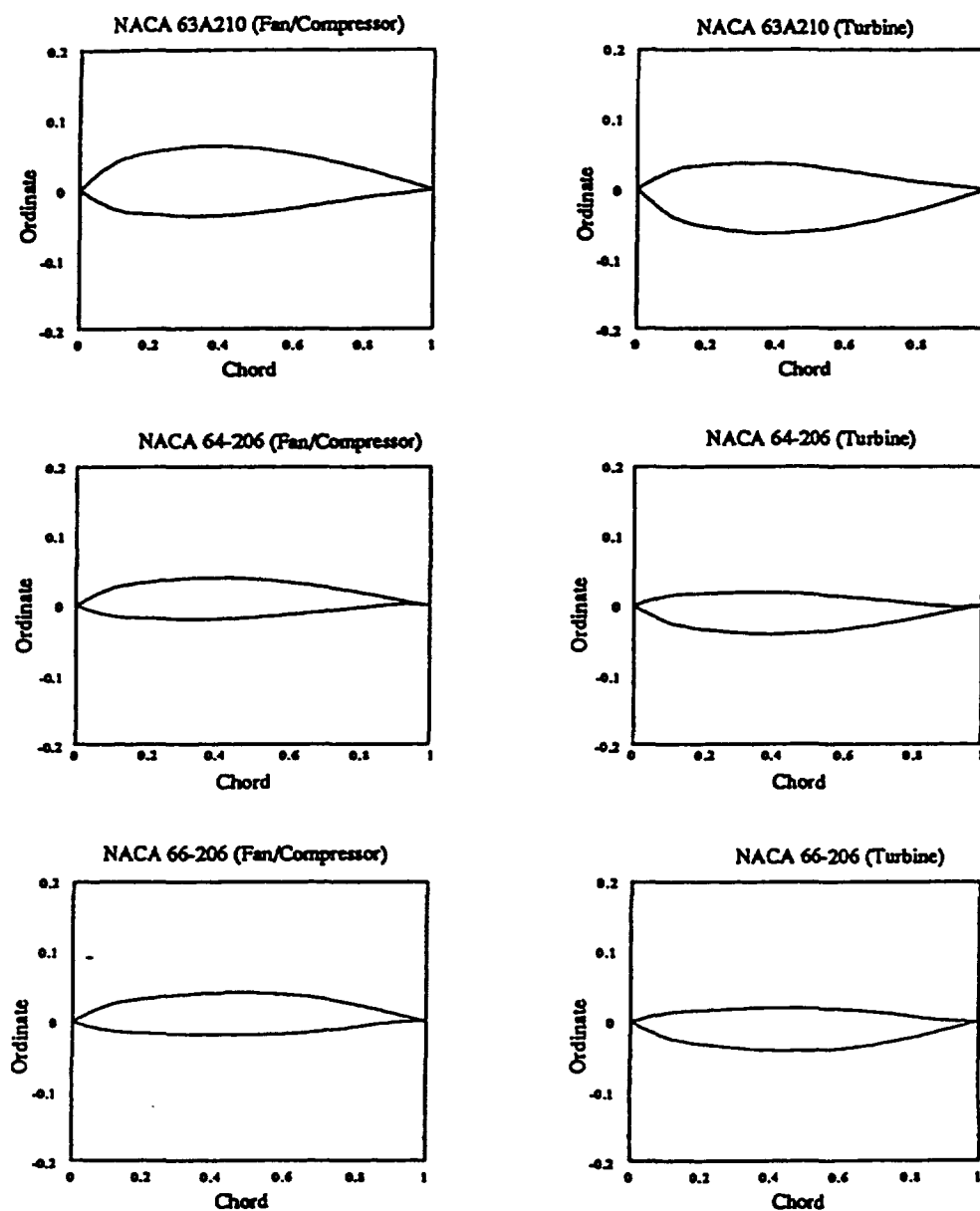


Figure B.1 T/BEST Airfoil Data Bank for Fan, Compressor and Turbine Blades

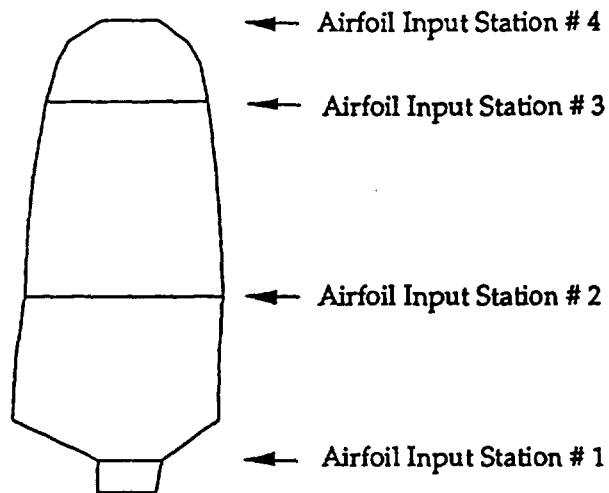


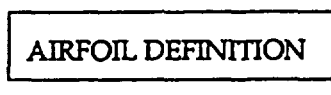
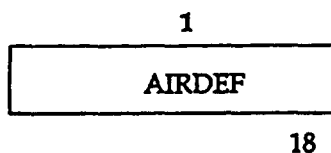
Figure B.2. Input Blade Details of an Unswept SR-2 Blade

The format of the airfoil data bank file is discussed next. Note that each data card is described by providing the variable name inside a rectangular box followed by an example. Also, the format required is noted as a subscript below the box.

B.2 Format of the Airfoil Data Bank

B.2.1 AIRFOIL DEFINITION Format

CARD A1



<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
1	AIRDEF	A18	Entry should be AIRFOIL DEFINITION.

CARD A2

1
AIRCODE
30

NACA 63A210 FAN

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
1	AIRCODE	A30	Keyword code name specific to the identification of the airfoil. The code name could be up to 30 characters length.

CARD A3

1	2	3	4
NSTA	NCOOR	STAGG	TROOT
11	11	35.0	6.0

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
1	NSTA	none	Number of airfoil stations that make up the blade.
2	NCOOR	none	Number of airfoil coordinates in a station.
3	STAGG	none	Stagger angle of the blade. Note that the same stagger angle will be used for all stations.
4	TROOT	none	Root thickness as a percentage of the chord. Always, the first station is used to estimate the root thickness as follows: (percentage)*(chord length of 1st station)

Note: When generating the blade model for BLASIM or MTSB, the same number of coordinates and stagger angle will be used for all stations.

CARD A4-a

Contents: axial airfoil coordinates

	1	2	3	4	5	6	7	
X	X(1)	X(2)	X(3)	X(4)	X(5)	X(6)	X(7)	
	10	20	30	40	50	60	70	80

X	0.000	0.100	0.200	0.300	0.400	0.500	0.600
---	-------	-------	-------	-------	-------	-------	-------

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
7 values per card	X	F	The x coordinates of the blade cross section given in ascending order for NO points in inches (Figure B.3).

CARD A4-b

Contents: Upper airfoil coordinates

1		2		3		4		5		6		7	
YUPPER	YU(1)	YU(2)	YU(3)	YU(4)	YU(5)	YU(6)	YU(7)						
10	20	30	40	50	60	70	80						

YUPPER	0.000	0.0245	0.0337	0.0388	0.0406	0.0387	0.0340
--------	-------	--------	--------	--------	--------	--------	--------

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
7 values per card	YUPPER	F	The upper y coordinates of the blade cross section corresponding to the x coordinates in inches (Figure B.3).

CARD A4-c

Contents: Lower airfoil coordinates

	1	2	3	4	5	6	7
YLOWER	YL(1)	YL(2)	YL(3)	YL(4)	YL(5)	YL(6)	YL(7)
10	20	30	40	50	60	70	80

YLOWER	0.000	0.0245	00337	0.0388	0.0406	0.0387	0.0340
--------	-------	--------	-------	--------	--------	--------	--------

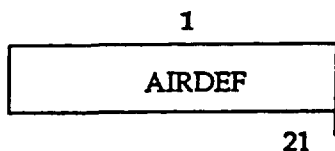
<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
7 values per card	YLOWER	F	The lower y coordinates of the blade cross section corresponding to the x coordinates in inches (Figure B.3).

Note: Data for CARDS A4-a , A4-b and A4-c are entered based on a percent of the chord. The data are later expanded when the blade model is generated:
 $X = x \cdot \text{chord}$, $YU = yupper \cdot \text{chord}$, and $YL = ylower \cdot \text{chord}$

The station chord length is calculated for each station based on the mean chord length obtained from the *NNEPWATE* output.

B.2.2 FULL BLADE DEFINITION Format

CARD B1



FULL BLADE DEFINITION

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
1	AIRDEF	A18	Entry should be FULL BLADE DEFINITION

CARD B2

1
ABLDEF
15

SR2 BLADE

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
1	ABLDEF	A15	Keyword code name specific to the identification of the blade. The code name could be up to 15 characters length.

CARD B3

1	2
NSTA	TROOT

5	1.08
---	------

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
1	NSTA	none	Number of airfoil stations that make up the blade.
2	TROOT	none	Root thickness in inches.

CARD B4

1	2	3
R(J)	ALPHA(J)	NO(J)
2.06	3.64	26

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
1	R	none	Distance from the engine center line to the blade station, inches. The first input station should be the blade attachment, the last the tip station.
2	ALPHA	none	Stagger angle or angle between plane of rotation of rotor stage and chord normal ($y=0$), degrees.
3	NO	none	The number of coordinate station along the chord used to describe the airfoil profile. Maximum of 53 points.

CARD B5

Contents: airfoil coordinates

	1	2	3	4	5	6	7	8
A6:	X(1)	X(2)	X(3)					
	8	16	24	32	40	48	56	

	1	2	3	4	5	6	7	8
A7:	YU(1)	YU(2)	YU(3)					
	8	16	24	32	40	48	56	

	1	2	3	4	5	6	7	
A8:	YL(1)	YL(2)	YL(3)					
	8	16	24	32	40	48	56	

0.000	0.128	0.256	0.384	0.512	0.639	0.767	0.895	1.023
-------	-------	-------	-------	-------	-------	-------	-------	-------

0.000	0.103	0.122	0.120	0.108	0.089	0.065	0.036	0.000
-------	-------	-------	-------	-------	-------	-------	-------	-------

0.000	-0.103	-0.122	-0.120	-0.108	-0.089	-0.065	-0.036	0.000
-------	--------	--------	--------	--------	--------	--------	--------	-------

<u>Field</u>	<u>Item</u>	<u>Format</u>	<u>Description</u>
9 values per card. Fields of 8.	X	F	The x coordinates of the blade cross section given in ascending order for NO points in inches (Figure B.3).
Start each set on a card.	YU	F	The upper y coordinates of the blade cross section corresponding to the x coordinates in inches (Figure B.3).
	YL	F	The lower y coordinates of the blade cross section corresponding to the x coordinates in inches (Figure B.3).

Note: Repeat inputting CARDS B3 and B4 for all stations.

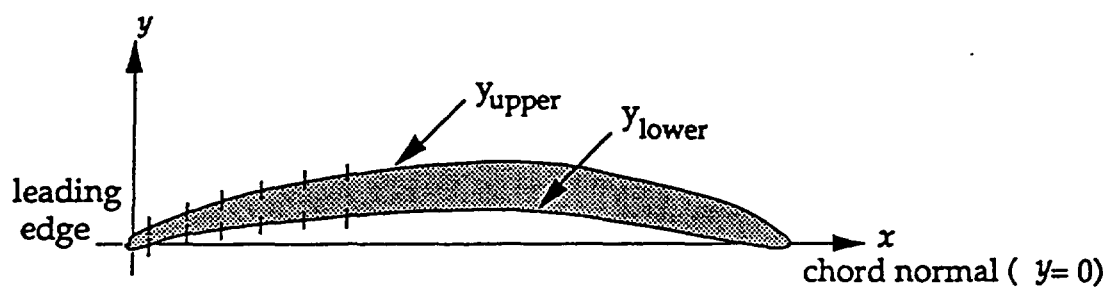


Figure B.3 1x2y Airfoil Section Coordinate Input

B.3 Listing of *airfoil.bank* file

AIRFOIL DEFINITION

NACA 63A210 FAN

11 11 35.0 6.0

X	0.00000	0.10000	0.20000	0.30000	0.40000	0.50000
0.60000						
X	0.70000	0.80000	0.90000	1.00000		
Y UPPER	0.00000	0.03939	0.05338	0.06063	0.06246	0.05943
0.05247						
Y UPPER	0.04233	0.02984	0.01526	0.00021		
Y LOWER	0.00000	-0.02709	-0.03461	-0.03762	-0.03690	-0.03283
-0.02639						
Y LOWER	-0.01857	-0.01100	-0.00536	-0.00021		

AIRFOIL DEFINITION

NACA 63A210 TURBINE

11 11 35.0 6.0

X	0.00000	0.10000	0.20000	0.30000	0.40000	0.50000
0.60000						
X	0.70000	0.80000	0.90000	1.00000		
Y UPPER	0.00000	0.02709	0.03461	0.03762	0.03690	0.03283
0.02639						
Y UPPER	0.01857	0.01100	0.00536	0.00021		
Y LOWER	0.00000	-0.03939	-0.05338	-0.06063	-0.06246	-0.05943
-0.05247						
Y LOWER	-0.04233	-0.02984	-0.01526	-0.00021		

AIRFOIL DEFINITION

NACA 64-206 FAN

11 11 35.0 6.0

X	0.00000	0.10000	0.20000	0.30000	0.40000	0.50000
0.60000						
X	0.70000	0.80000	0.90000	1.00000		
Y UPPER	0.00000	0.02451	0.03370	0.03880	0.04066	0.03878
0.03403						
Y UPPER	0.02714	0.01870	0.00941	0.00000		
Y LOWER	0.00000	-0.01406	-0.01773	-0.01935	-0.01924	-0.01672
-0.01259						
Y LOWER	-0.00767	-0.00275	0.00094	0.00000		

AIRFOIL DEFINITION

NACA 64-206 TURBINE

11 11 35.0 6.0

X	0.00000	0.10000	0.20000	0.30000	0.40000	0.50000
0.60000						
X	0.70000	0.80000	0.90000	1.00000		
Y UPPER	0.00000	0.01406	0.01773	0.01935	0.01924	0.01672
0.01259						
Y UPPER	0.00767	0.00275	-0.00094	0.00000		
Y LOWER	0.00000	-0.02451	-0.03370	-0.03880	-0.04066	-0.03878
-0.03403						
Y LOWER	-0.02714	-0.01870	-0.00941	0.00000		

Listing of *airfoil.bank* file (Continued)

AIRFOIL DEFINITION

NACA 66-206 FAN

11 11 35.0 6.0

X	0.00000	0.10000	0.20000	0.30000	0.40000	0.50000
0.60000						
X	0.70000	0.80000	0.90000	1.00000		
Y UPPER	0.00000	0.02274	0.03199	0.03755	0.04042	0.04088
0.03887						
Y UPPER	0.03290	0.02342	0.01185	0.00000		
Y LOWER	0.00000	-0.01231	-0.01602	-0.01809	-0.01899	-0.01743
-0.01342						
Y LOWER	-0.00745	-0.00147	0.00000			

AIRFOIL DEFINITION

NACA 66-206 TURBINE

11 11 35.0 6.0

X	0.00000	0.10000	0.20000	0.30000	0.40000	0.50000
0.60000						
X	0.70000	0.80000	0.90000	1.00000		
Y UPPER	0.00000	0.01231	0.01602	0.01809	0.01899	0.01743
0.01342						
Y UPPER	0.00745	0.00147	0.00000			
Y LOWER	0.00000	-0.02274	-0.03199	-0.03755	-0.04042	-0.04088
-0.03887						
Y LOWER	-0.03290	-0.02342	-0.01185	0.00000		

FULL BLADE DEFINITION

MODIFIED SR2 BL

5 1.08

2.060			3.64				26	
0.000	0.005	0.008	0.013	0.026	0.051	0.077	0.102	0.153
0.205	-0.256	0.307	0.358	0.409	0.460	0.512	0.563	0.614
0.665	0.716	0.767	0.818	0.870	0.921	0.972	1.023	
0.000	0.012	0.015	0.018	0.025	0.035	0.042	0.049	0.058
0.065	0.071	0.074	0.076	0.077	0.075	0.072	0.067	0.062
0.056	0.048	0.040	0.031	0.021	0.012	0.005	0.000	
0.000	-0.012	-0.015	-0.018	-0.025	-0.035	-0.042	-0.049	-0.058
-0.065	-0.071	-0.074	-0.076	-0.077	-0.075	-0.072	-0.067	-0.062
-0.056	-0.048	-0.040	-0.031	-0.021	-0.012	-0.005	0.000	
2.778			3.64				26	
0.000	0.005	0.008	0.013	0.026	0.051	0.077	0.102	0.153
0.205	0.256	0.307	0.358	0.409	0.460	0.512	0.563	0.614
0.665	0.716	0.767	0.818	0.870	0.921	0.972	1.023	
0.000	0.012	0.015	0.018	0.025	0.035	0.042	0.049	0.058
0.065	0.071	0.074	0.076	0.077	0.075	0.072	0.067	0.062
0.056	0.048	0.040	0.031	0.021	0.012	0.005	0.000	
0.000	-0.012	-0.015	-0.018	-0.025	-0.035	-0.042	-0.049	-0.058
-0.065	-0.071	-0.074	-0.076	-0.077	-0.075	-0.072	-0.067	-0.062
-0.056	-0.048	-0.040	-0.031	-0.021	-0.012	-0.005	0.000	
6.389			25.53				26	
0.000	0.018	0.027	0.046	0.091	0.183	0.274	0.365	0.548
0.730	0.913	1.095	1.278	1.460	1.643	1.825	2.008	2.190
2.372	2.555	2.738	2.920	3.103	3.285	3.467	3.650	
0.000	0.044	0.052	0.066	0.090	0.125	0.151	0.173	0.207
0.233	0.252	0.265	0.272	0.274	0.267	0.256	0.240	0.221

Listing of *airfoil.bank* file (Continued)

0.199	0.173	0.143	0.110	0.076	0.044	0.016	0.000	
0.000	-0.044	-0.052	-0.066	-0.090	-0.125	-0.151	-0.173	-0.207
-0.233	-0.252	-0.265	-0.272	-0.274	-0.267	-0.256	-0.240	-0.221
-0.199	-0.173	-0.143	-0.110	-0.076	-0.044	-0.016	0.000	
10.447			36.44				26	
0.000	0.017	0.025	0.042	0.084	0.168	0.251	0.335	0.502
0.670	0.837	1.005	1.172	1.340	1.507	1.675	1.842	2.010
2.177	2.345	2.512	2.680	2.848	3.015	3.182	3.350	
0.000	0.040	0.048	0.060	0.082	0.115	0.139	0.159	0.190
0.214	0.231	0.243	0.250	0.251	0.245	0.235	0.221	0.203
0.183	0.159	0.131	0.101	0.070	0.040	0.015	0.000	
0.000	-0.040	-0.048	-0.060	-0.082	-0.115	-0.139	-0.159	-0.190
-0.214	-0.231	-0.243	-0.250	-0.251	-0.245	-0.235	-0.221	-0.203
-0.183	-0.159	-0.131	-0.101	-0.070	-0.040	-0.015	0.000	
12.250			40.10				26	
0.000	0.006	0.009	0.015	0.031	0.062	0.092	0.123	0.185
0.246	0.308	0.369	0.431	0.492	0.553	0.615	0.677	0.738
0.799	0.861	0.923	0.984	1.046	1.107	1.168	1.230	
0.000	0.015	0.018	0.022	0.030	0.042	0.051	0.058	0.070
0.079	0.085	0.089	0.092	0.092	0.090	0.086	0.081	0.075
0.067	0.058	0.048	0.037	0.026	0.015	0.005	0.000	
0.000	-0.015	-0.018	-0.022	-0.030	-0.042	-0.051	-0.058	-0.070
-0.079	-0.085	-0.089	-0.092	-0.092	-0.090	-0.086	-0.081	-0.075
-0.067	-0.058	-0.048	-0.037	-0.026	-0.015	-0.005	0.00	

APPENDIX C

T/BEST NEUTRAL FILE INPUT & OUTPUT

In this appendix, the sources used to obtain all parameters of the neutral file are identified. These parameters fall under three categories:

1. neutral file input parameters
2. neutral file output parameters
3. neutral file defaulted parameters

All the neutral file data obtained from a module or given to a module are listed. A module can use neutral file parameters as input. Also, that same module can provide some neutral file parameters through its output. The T/BEST modules NNEPWATE, BLASIM, MTSB, and FLOPS do not supply the neutral file directly with any data. The input generators of these modules use data from neutral file to generate the required input files. Once these modules are executed, the post-processors are used to update the neutral file for the selected parameters. Note that the graphic modules, bchart and pchart, read the neutral file to display selected results.

C.1 NEUTGEN Module: permits the update of any defaulted parameter

The execution of this module sets the foundation for generating the neutral file. A block of data is initialized at this stage beginning with the parameter ALT to the end of the neutral file. Some of these parameters are updated during the course of executing T/BEST. This block of data is written to a file named *neutral.add* and stored in the user's input directory. Also, depending on the user's level of expertise, beginner, or intermediate, or expert, parameters in the neutral file may be assigned new values.

The *neutral.add* file will be generated only if it does not exist during the execution of T/BEST. It will give the user the opportunity to edit this file and modify any defaulted parameters. This procedure of modifying defaulted parameters can be used as an alternate method to the one mentioned in the previous paragraph.

Listing of the neutral.add file

CRUISE ALTITUDE	ALT	0.60000E+05	(ft.)
CRUISE SPEED	VC	0.24000E+01	(MACH NO.)
CRUISE SPECIFIC FUEL CONSUM	SFCC	0.12050E+01	(LB/LBT/HR)
CRUISE THRUST	ATC	0.16285E+05	(LBST)
RANGE	RANGE	0.50000E+04	(MILES)
BREGUET RANGE	BRANGE	0.70997E+04	(MILES)
TIME TO CLIMB	TC	0.50000E+00	(HOURS)
TIME TO DECEND	TD	0.50000E+00	(HOURS)
DAY NITE FACTOR	DNF	0.12500E+01	
SPARE PARTS FACTOR	SPF	0.15000E+01	
CAPTAIN'S PAY	ODPP	0.50000E+00	(\$/HOUR)
COPILOT'S PAY	ODPCP	0.25000E+00	(\$/HOUR)
FLIGHT'S ENGINEER PAY	ODPFE	0.25000E+00	(\$/HOUR)
GROSS NAT. PROD. DEF. RAT.	GNPDR	4.08122E+00	
DOMESTIC TRAVEL FACTOR	ED	0.18000E+01	(\$/HOUR)
INTERNATIONAL TAVEL FACTOR	EI	0.28000E+01	(\$/HOUR)
TRAINING FACTOR	KT	0.40000E-01	
VACATION FACTOR	KV	0.50000E-01	
CREW PREMIUM FACTOR	KP	0.50000E-01	
PAYROLL TAX FACTOR	KI	0.12000E+00	
ANNUAL FLIGHT HOURS (U.S.A)	AHD	0.80000E+03	(HOURS)
ANNUAL FLIGHT HOURS (INT.)	AHI	0.75000E+03	(HOURS)
CAPTAIN'S BASE PAY	BPP	0.36000E+04	(\$/YEAR)
1ST OFFICER'S BASE PAY	BPCP	0.32000E+04	(\$/YEAR)
FLIGHT ENGINEER'S BASE PAY	BPFE	0.34000E+04	(\$/YEAR)
FUEL COST (USA)	AFUELD	0.11000E+00	(\$/GAL)
FUEL COST (INTERNATIONAL)	AFUELI	0.14000E+00	(\$/GAL)
JET OIL COST (US)	BOILTD	0.60000E+01	(\$/GAL)
JET OIL COST (INT.)	BOILTI	0.60000E+01	(\$/GAL)
ENGINE OIL (US)	BOILRD	0.41000E+00	(\$/GAL)
ENGINE OIL (INT.)	BOILRI	0.62000E+00	(\$/GAL)
FUEL CONSUMED AT CRUISE	FCR	0.00000E+00	(LBS)
FUEL USED IN CLIMB	FCL	0.15659E+05	(LBS)
FUEL USED IN DESCENT	FD	0.15659E+05	(LBS)
FUEL FOR GROUND MANEUVERS	FGM	0.15659E+05	(LBS)
DISTANCE FOR CLIMB	DC	0.57799E+03	(MILES)
DISTANCE DESCENT	DD	0.57799E+03	(MILES)
MANEUVERING DISTANCE	DAM	0.28899E+02	(MILES)
GROUND SPEED	VG	0.26784E+04	(MPH)
COST OF COMPLETE AIRPLANE	CT	0.12916E+08	(\$)
COST OF AIRPLANE LESS ENG.	CSPA	0.10819E+08	(\$)
COST OF AIR. LESS ENG,PROP	CA	0.10819E+08	(\$)
COST OF ONE ENGINE	CE	0.52426E+06	(\$)
COST OF ONE PROP	CP	0.52426E+05	(\$)
NUMBER OF PROPS	ANP	0.00000E+00	
TIME BETWEEN ENG. OVERHAULS	HEO	0.11000E+04	(HOURS)
TAKEOFF EQUIV. HORSE POWER	ESHP	0.00000E+00	(LBS)
DENSITY OF FUEL	WF	0.65000E+01	(LBS/GAL)
DENSITY OF OIL	WO	0.81000E+01	(LBS/GAL)
INSURANCE RATE DOLLAR/VALUE	AIRA	0.40000E-01	(%/YR, eg .04)
INSURANCE: LIABILITY&DAMAGE	PLPD	0.87000E-03	(\$/MILE)
LABOR COST	RL	0.30000E+01	(\$/HOUR)
AIRPLANE DEPRECIAT. FACTOR	AKDA	0.85000E+00	
ENGINE DEPRECIATION FACTOR	AKDE	0.85000E+00	
PROP DEPRECIATION FACTOR	AKDP	0.85000E+00	
SPARE AIRPLANE DEPRECIATION	AKDSA	0.85000E+00	
SPARE ENGINE DEPRECIATION	AKDSE	0.85000E+00	
AIRFRAME DEPRECIATION	DA	0.10000E+02	(YEARS)
ENGINE DEPRECIATION	DE	0.70000E+01	(YEARS)

Listing of the neutral.add file (Continued)

PROP DEPRECIATION	DP	0.70000E+01	(YEARS)
SPARE AIRFRAME DEPRECIATION	DAS	0.10000E+02	(YEARS)
SPARE ENGINE DEPRECIATION	DES	0.10000E+02	(YEARS)
AIRPLANE SPARES/AIR. PRICE	AKSPA	0.10000E+00	
ENGINE SPARES/ENGINE PRICE	AKSPE	0.50000E+00	
BLOCK FUEL	FB	0.15659E+06	(LBS)
CAPTAIN GROSS WEIGHT FACTOR	GWFP	0.59748E+01	(\$/HR)
1ST OF. GROSS WEIGHT FACTOR	GWFCP	0.29029E+01	(\$/HR)
FLT. ENG. GROSS WT. FACTOR	GWFFE	0.30832E+01	(\$/HR)
CAPTAIN MILEAGE RATE FACTOR	XMRFP	0.30573E+02	(\$/HR)
1ST OF. MILEAGE RATE FACTOR	XMRCP	0.16027E+02	(\$/HR)
FLT ENG MILEAGE RATE FACTOR	XMRFE	0.14731E+02	(\$/HR)
TIME TO CRUISE DOMESTIC	TGD	0.18666E+01	(HOURS)
GROUND MANUEVERING TIME	TGM	0.42945E+00	(HOURS)
DOMESTIC BLOCK TIME	TBD	0.32961E+01	(HOURS)
DOMESTIC BLOCK SPEED	VBD	0.17536E+04	(MPH)
DOM. TURBINE AIRCRAFT UTIL.	UTD	0.32583E+04	(HRS/YEAR)
DOM. RECP. ENG. AIR. UTIL.	URD	0.35759E+04	(HRS/YEAR)
INTERNATIONAL BLOCK SPEED	VBI	0.18129E+04	(MPH)
INTERNATIONAL BLOCK TIME	TBI	0.31882E+01	(HOURS)
TIME TO CRUISE INTERNAT.	TGI	0.17587E+01	(HOURS)
INT TURBINE AIR. UTILIZAION	UTI	0.32503E+04	(HRS/YEAR)
INT RECP. ENG. AIR. UTIL.	URI	0.35636E+04	(HRS/YEAR)
CAPTAINS DOMESTIC COST	CAMPD	0.30880E-01	(\$/MILE)
1S OFFICERS DOMESTIC COST	CAMCPD	0.17682E-01	(\$/MILE)
FLIGHT ENG. DOMESTIC COST	CAMFED	0.28443E-01	(\$/MILE)
DOMESTIC FUEL COST	CFTD	0.47224E+00	(\$/MILE)
DOMESTIC OIL COST	COTD	0.11661E-02	(\$/MILE)
DOMESTIC INSURANCE COSTS	CINTD	0.91290E-01	(\$/MILE)
DOM TURB AIRFR LABOR COST	ALBTD	0.34604E-01	(\$/MILE)
DOM TURB AIRFR BURDEN COST	ALBTDMB	0.30797E-01	(\$/MILE)
DOM REC ENG AIR LABOR COST	ALBRD	0.32313E-01	(\$/MILE)
DOM REC ENG BURDEN COST	ALBRDMB	0.28758E-01	(\$/MILE)
DOM TURB ENG LABOR MAINT.	ELBTD	0.94044E-02	(\$/MILE)
DOM TURB ENG BURDEN COST	ELBTDMB	0.83699E-02	(\$/MILE)
DOM TURBPROP ENG LABOR MAIN	ELBPD	0.69786E-02	(\$/MILE)
DOM TURBPROP ENG BURDEN	ELBPDMB	0.62109E-02	(\$/MILE)
DOM REC ENG. LABOR MAINT.	ELBRD	0.37265E-01	(\$/MILE)
DOM REC ENG MAINT BURDEN	ELBRDMB	0.33166E-01	(\$/MILE)
DOM TURB ENG AIR MAINT MATE	CMATD	0.51669E-01	(\$/MILE)
DOM TURB ENG AIR MAINT BURD	CMATDMB	0.12039E-01	(\$/MILE)
DOM REC ENG AIR MAINT MATE	CMARD	0.31946E-01	(\$/MILE)
DOM REC ENG AIR MAINT BURD	CMARDMB	0.74435E-02	(\$/MILE)
DOM TURB ENG MAINT MATERIAL	CMETD	0.99222E-01	(\$/MILE)
DOM TURB ENG MAINT BURDEN	CMETDMB	0.23119E-01	(\$/MILE)
DOM REC ENG MAINT MATERIALS	CMERD	0.37778E+00	(\$/MILE)
DOM REC ENG MAINT BURDEN	CMERDMB	0.88022E-01	(\$/MILE)
DOM TURB AIR APP MAINT BURD	CMBTD	0.74325E-01	(\$/MILE)
DOM REC ENG AIR APP BURDEN	CMBRD	0.15739E+00	(\$/MILE)
DOM TURBPROP AIR. APP. BURD	CMBPD	0.72166E-01	(\$/MILE)
DOM TURB AIR DEPRECIATION	CDATD	0.16094E+00	(\$/MILE)
DOM REC ENG AIRCRAFT DEPREC	CDARD	0.14665E+00	(\$/MILE)
DOM TURB ENG DEPRECIATION	CDETD	0.44567E-01	(\$/MILE)
DOM. REC. ENG DEPRECIATION	CDERD	0.40609E-01	(\$/MILE)
DOM SPARE TURB AIR. DEPRECI	DSATD	0.16094E-01	(\$/MILE)
DOM SPARE REC ENG AIR DEPRE	DSARD	0.14665E-01	(\$/MILE)
DOM. SPARE TURB ENG DEPRECI	DSETD	0.33426E-01	(\$/MILE)

Listing of the neutral.add file (Continued)

DOM. SPARE REC. ENG DEPRECI	DSERD	0.30457E-01	(\$/MILE)
DOM. SPARE PROP DEPRECIATIO	CDPD	0.00000E+00	(\$/MILE)
INTERNATIONAL FUEL COSTS	CFTI	0.60103E+00	(\$/MILE)
INTERNATIONAL OIL COSTS	COTI	0.11279E-02	(\$/MILE)
INTERNATIONAL INSURANCE	CINTI	0.88545E-01	(\$/MILE)
INT. TURB AIRFRAME LABOR	ALBTI	0.33471E-01	(\$/MILE)
INT. REC. ENG. AIR LABOR	ALBRI	0.31255E-01	(\$/MILE)
INT. TURB ENG LABOR MAINT	ELBTI	0.90965E-02	(\$/MILE)
INT TURBPROP ENG. LABOR MAI	ELBPI	0.67501E-02	(\$/MILE)
INT REC ENG AIR MAINTENAN	ELBRI	0.36045E-01	(\$/MILE)
INT TURB ENG AIR MAIN MATER	CMATI	0.49978E-01	(\$/MILE)
INT REC ENG AIR MAINT MATER	CMARI	0.30901E-01	(\$/MILE)
INT TURB ENG MAINT MATERIAL	CMETI	0.95974E-01	(\$/MILE)
INT REC ENG MAINT MATERIALS	CMERI	0.36541E+00	(\$/MILE)
INT TURB AIR APP MAINT BURD	CMBTD	0.74325E-01	(\$/MILE)
INT REC ENG AIR APP BURD	CMBRD	0.15739E+00	(\$/MILE)
INT. TURBOPROP AIR APP BURD	CMBPD	0.72166E-01	(\$/MILE)
INT. TURB AIR DEPRECIATION	CDATI	0.15606E+00	(\$/MILE)
INT REC ENG AIR DEPRECIATIO	CDARI	0.14234E+00	(\$/MILE)
INT TURB ENG DEPRECIATION	CDETI	0.43215E-01	(\$/MILE)
INT. REC. ENG DEPRECIATION	CDERI	0.39415E-01	(\$/MILE)
INT. SPARE TURB. AIR DEPREC	DSATI	0.15606E-01	(\$/MILE)
INT SPARE REC ENG AIR DEPR	DSARI	0.14234E-01	(\$/MILE)
INT. SPARE TURB ENG DEPRECI	DSETI	0.32411E-01	(\$/MILE)
INT. SPARE REC. ENG DEPRECI	DSERI	0.29561E-01	(\$/MILE)
INT. SPARE PROP DEPRECIATIO	CDPI	0.00000E+00	(\$/MILE)
U. S. CITY PAIRS	USCITY	0.21550E+04	
WESTERN EUROPE CITY PAIRS	INTCITY	0.44910E+04	
NEW JET/FAN MAIN. COST 1YR	NEWT1	0.31526E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 1YR	DETR1	0.35029E-01	(\$/MILE)
NEW JET/FAN MAIN. COST 2YR	NEWT2	0.45537E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 2YR	DETR2	0.70058E-01	(\$/MILE)
NEW JET/FAN MAIN. COST 3YR	NEWT3	0.38532E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 3YR	DETR3	0.10509E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 4YR	NEWT4	0.31526E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 4YR	DETR4	0.12260E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 5YR	NEWT5	0.24520E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 5YR	DETR5	0.13136E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 6YR	NEWT6	0.21017E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 6YR	DETR6	0.14012E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 7YR	NEWT7	0.17514E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 7YR	DETR7	0.14362E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 8YR	NEWT8	0.15763E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 8YR	DETR8	0.14362E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 9YR	NEWT9	0.14012E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 9YR	DETR9	0.14012E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 10YR	NEWT10	0.13661E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 10YR	DETR10	0.13661E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 11YR	NEWT11	0.13311E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 11YR	DETR11	0.13311E+00	(\$/MILE)
NEW JET/FAN MAIN. COST 12YR	NEWT12	0.13136E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 12YR	DETR12	0.13136E+00	(\$/MILE)
NEW JET/FAN 8YR TOTAL	NEWTJET	0.36444E+07	(\$)
DERIVATIVE JET/FAN 8YR TOTA	DETRJET	0.14380E+07	(\$)
NEW TURPROP MAIN. COST 1YR	NEWP1	0.30494E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 1YR	DERP1	0.33883E-01	(\$/MILE)
NEW TURPROP MAIN. COST 2YR	NEWP2	0.44047E+00	(\$/MILE)
DERIVATIVE JET/FAN ENG 2YR	DERP2	0.67765E-01	(\$/MILE)
NEW TURPROP MAIN. COST 3YR	NEWP3	0.37271E+00	(\$/MILE)

Listing of the *neutral.add* file (Continued)

DERIVATIVE JET/FAN ENG 3YR	DERP3	0.10165E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 4YR	NEWP4	0.30494E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 4YR	DERP4	0.11859E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 5YR	NEWP5	0.23718E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 5YR	DERP5	0.12706E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 6YR	NEWP6	0.20330E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 6YR	DERP6	0.13553E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 7YR	NEWP7	0.16941E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 7YR	DERP7	0.13892E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 8YR	NEWP8	0.15247E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 8YR	DERP8	0.13892E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 9YR	NEWP9	0.13553E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 9YR	DERP9	0.13553E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 10YR	NEWP10	0.13214E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 10YR	DERP10	0.13214E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 11YR	NEWP11	0.12875E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 11YR	DERP11	0.12875E+00	(\$/MILE)	
NEW TURPROP MAIN. COST 12YR	NEWP12	0.12706E+00	(\$/MILE)	
DERIVATIVE JET/FAN ENG 12YR	DERP12	0.12706E+00	(\$/MILE)	
NEW RECIENG 8YR TOTAL	NEWPJET	0.35252E+07	(\$)	
DERIVATIVE RECIENG 8YR TOTA	DERPJET	0.13909E+07	(\$)	
NEW RECIENG MAIN. COST 1YR	NEWR1	0.12065E+01	(\$/MILE)	
DERIVATIVE RECIENG ENG 1YR	DERR1	0.13406E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 2YR	NEWR2	0.17428E+01	(\$/MILE)	
DERIVATIVE RECIENG ENG 2YR	DERR2	0.26812E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 3YR	NEWR3	0.14746E+01	(\$/MILE)	
DERIVATIVE RECIENG ENG 3YR	DERR3	0.40217E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 4YR	NEWR4	0.12065E+01	(\$/MILE)	
DERIVATIVE RECIENG ENG 4YR	DERR4	0.46920E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 5YR	NEWR5	0.93841E+00	(\$/MILE)	
DERIVATIVE RECIENG ENG 5YR	DERR5	0.50272E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 6YR	NEWR6	0.80435E+00	(\$/MILE)	
DERIVATIVE RECIENG ENG 6YR	DERR6	0.53623E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 7YR	NEWR7	0.67029E+00	(\$/MILE)	
DERIVATIVE RECIENG ENG 7YR	DERR7	0.54964E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 8YR	NEWR8	0.60326E+00	(\$/MILE)	
DERIVATIVE RECIENG ENG 8YR	DERR8	0.54964E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 9YR	NEWR9	0.53623E+00	(\$/MILE)	
DERIVATIVE RECIENG ENG 9YR	DERR9	0.53623E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 10YR	NEWR10	0.52283E+00	(\$/MILE)	
DERIVATIVE RECIENG ENG 10YR	DERR10	0.52283E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 11YR	NEWR11	0.50942E+00	(\$/MILE)	
DERIVATIVE RECIENG ENG 11YR	DERR11	0.50942E+00	(\$/MILE)	
NEW RECIENG MAIN. COST 12YR	NEWR12	0.50272E+00	(\$/MILE)	
DERIVATIVE RECIENG ENG 12YR	DERR12	0.50272E+00	(\$/MILE)	
NEW RECIENG 8YR TOTAL	NEWRENG	0.13948E+08	(\$)	
DERIVATIVE RECIENG 8YR TOTA	DERRENG	0.55034E+07	(\$)	
LOW PRESSURE COMPRESS PRICE	LCPRICE	0.00000E+00	(\$)	
HIGH PRESSURE COMPRES PRICE	HCPRICE	0.00000E+00	(\$)	
INLET PRICE	INPRICE	0.00000E+00	(\$)	(NOT ACTUAL)
DUCT PRICE	DUPRICE	0.00000E+00	(\$)	(NOT ACTUAL)
BURNER PRICE	BUPRICE	0.00000E+00	(\$)	(NOT ACTUAL)
AUGMENTER PRICE	AUPRICE	0.00000E+00	(\$)	(NOT ACTUAL)
MIXER PRICE	FMPRICE	0.00000E+00	(\$)	(NOT ACTUAL)
NOZZLE PRICE	NOPRICE	0.00000E+00	(\$)	(NOT ACTUAL)

Listing of the neutral.add file (Continued)

SHAFT PRICE	SHPRICE	0.00000E+00	(\$)	(NOT ACTUAL)
DIFFUSER PRICE	DIFPRICE	0.00000E+00	(\$)	
COMBUSTOR PRICE	CBPRICE	0.00000E+00	(\$)	
HIGH PRESSURE TURBINE PRICE	HTPRICE	0.00000E+00	(\$)	
LOW PRESSURE TURBINE PRICE	LTPRICE	0.00000E+00	(\$)	
LOW PRESSURE COMPRESS MTBR	LCMTBR	0.00000E+00	(HR)	
HIGH PRESSURE COMPRESS MTBR	HCMTBR	0.00000E+00	(HR)	
INLET MEAN TIME REPAIR	INMTBR	0.00000E+00	(HR)	
DUCT MEAN TIME REPAIR	DUMTBR	0.00000E+00	(HR)	
BURNER MEAN TIME REPAIR	BUMTBR	0.00000E+00	(HR)	
AUGMENTER MEAN TIME REPAIR	AUMTBR	0.00000E+00	(HR)	
MIXER MEAN TIME REPAIR	FMMTBR	0.00000E+00	(HR)	
NOZZLE MEAN TIME REPAIR	NOMTBR	0.00000E+00	(HR)	
SHAFT MEAN TIME REPAIR	SHMTBR	0.00000E+00	(HR)	
DIFFUSER MTBR	DIFMTBR	0.00000E+00	(HR)	
COMBUSTOR MTBR	CBMTBR	0.00000E+00	(HR)	
HIGH PRESSURE TURBINE MTBR	HTMTBR	0.00000E+00	(HR)	
LOW PRESSURE TURBINE MTBR	LTMTBR	0.00000E+00	(HR)	
LOW PRESSURE COMPRESS LABOR	LCHOURS	0.00000E+00	(HR)	
HIGH PRESSURE COMPRESS LABOR	HCHOURS	0.00000E+00	(HR)	
INLET LABOR	INHOURS	0.00000E+00	(HR)	
DUCT LABOR	DUHOURS	0.00000E+00	(HR)	
BURNER LABOR	BUHOURS	0.00000E+00	(HR)	
AUGMENTER LABOR	AUHOURS	0.00000E+00	(HR)	
MIXER LABOR	FMHOURS	0.00000E+00	(HR)	
NOZZLE LABOR	NOHOURS	0.00000E+00	(HR)	
SHAFT LABOR	SHHOURS	0.00000E+00	(HR)	
DIFFUSER LABOR	DIFHOURS	0.00000E+00	(HR)	
COMBUSTOR LABOR	CBHOURS	0.00000E+00	(HR)	
HIGH PRESSURE TURBINE LABOR	HTHOURS	0.00000E+00	(HR)	
LOW PRESSURE TURBINE LABOR	LTHOURS	0.00000E+00	(HR)	
LPC MATERIALS COST	LCCOST	0.00000E+00	(\$)	
HPC MATERIALS COST	HCCOST	0.00000E+00	(\$)	
INLET MATERIALS COST	INCOST	0.00000E+00	(\$)	(NOT ACTUAL)
DUCT MATERIALS COST	DUCOST	0.00000E+00	(\$)	(NOT ACTUAL)
BURNER MATERIALS COST	BUCOST	0.00000E+00	(\$)	(NOT ACTUAL)
AUGMENTER MATERIALS COST	AUCOST	0.00000E+00	(\$)	(NOT ACTUAL)
MIXER MATERIALS COST	FM COST	0.00000E+00	(\$)	(NOT ACTUAL)
NOZZLE MATERIALS COST	NOCOST	0.00000E+00	(\$)	(NOT ACTUAL)
SHAFT MATERIALS COST	SHCOST	0.00000E+00	(\$)	(NOT ACTUAL)
DIFFUSER MATERIALS COST	DIFCOST	0.00000E+00	(\$)	
COMBUSTOR MATERIALS COS	CBCOST	0.00000E+00	(\$)	
HPT MATERIALS COST	HTCOST	0.00000E+00	(\$)	
LPT MATERIALS COST	LTCOST	0.00000E+00	(\$)	
BEGIN FLOPS DATA				
FLOPS PROGRAM CONTROL				
FLOPS PROBLEM TYPE	IOPT	1		
FLOPS ANALYSIS OPTION	IANAL	3		
FLOPS COST ANALYSIS FLAG	ICOST	1		
FLOPS GEOMETRIC, WEIGHT, BALANCE AND INERTIA DATA				
STRUCTURAL ULTIMATE LOAD	ULF	0.42200E+01	(FACTOR)	
FLOPS WING DATA				
DIHEDRAL (POSITIVE)	DIH	0.70000E+00	(deg.)	
FLOPS HORIZONTAL TAIL DATA				
AREA	SHT	0.38881E+03	(ft^2)	
1/4 CHORD SWEEP ANGLE	SWPHT	0.35000E+02	(deg.)	
ASPECT RATIO	ARHT	0.40000E+01		
TAPER RATIO	TRHT	0.40000E+00		
T/C	TCHT	0.11000E+00		
LOCATION ON VERTICAL TAIL	HHT	0.10000E+01		

Listing of the neutral.add file (Continued)

FLOPS VERTICAL TAIL DATA			
NUMBER OF VERTICAL TAILS	NVERT	1	
AREA	SVT	0.39387E+03	(ft^2)
1/4 CHORD SWEEP ANGLE	SWPVT	0.55000E+02	(deg.)
ASPECT RATIO	ARVT	0.67000E+00	
TAPER RATIO	TRVT	0.70000E+00	
T/C	TCVT	0.12000E+00	
FLOPS FUSELAGE DATA			
NUMBER OF FUSELAGES	NFUSE	1	
TOTAL LENGTH	XL	0.15235E+03	(ft)
MAXIMUM WIDTH	WF	0.16440E+02	(ft)
MAXIMUM DEPTH	DF	0.17000E+02	(ft)
CARGO AIRCRAFT FACTOR	CARGF	0.00000E+00	
PASSENGER COMPART LENGTH	XLP	0.00000E+00	(ft)
FLOPS LANDING GEAR DATA			
LENGTH OF MAIN GEAR	XMLG	0.00000E+00	(in)
LENGTH OF NOSE GEAR	XNLG	0.00000E+00	(in)
CARRIER BASED AIRCRAFT	CARBAS	0.00000E+00	
FLOPS PROPULSION SYSTEM DATA			
NUMBER OF ENGINES ON WING	NEW	4	
NUMBER OF ENGINES ON FUSE	NEF	0	
BASELINE ENGINE THRUST	THRSO	0.50000E+05	(lbf)
BASELINE ENGINE WEIGHT	WENG	0.15491E+05	(lbf)
WEIGHT SCALING PARAMETER	EEXP	0.11500E+01	
BASELINE NACELLE LENGTH	XNAC	0.17920E+02	(ft)
BASELINE NACELLE DIAMETER	DNAC	0.12550E+02	(ft)
FUEL CAPACITY OF WING	FULWMX	-0.10000E+01	(lbm)
FUEL CAPACITY OF FUSELAGE	FULFMX	0.00000E+00	(lbm)
AUX. TANK FUEL CAPACITY	FULAUX	0.00000E+00	(lbm)
NUMBER OF FUEL TANKS	NTANK	10	
ADDED MISC PROP SYSTEM WT	WPMISC	0.00000E+00	(lbf)
FLOPS CREW AND PAYLOAD DATA			
FIRST CLASS PASSENGERS	NPF	20	
TOURIST PASSENGERS	NPT	180	
STEWARDESSES	NSTU	5	
GALLEY CREW	NGALC	0	
FLIGHT CREW	NFLCR	3	
WEIGHT PER PASSENGER	WPPASS	0.16500E+03	(lbf)
BAGGAGE PER PASSENGER	BPP	0.40000E+02	(lbf)
FLOPS OVERRIDE PARAMETERS FOR WEIGHTS (ALL SET TO 1.0 EXCEPT WTHR)			
THRUST REVERSERS - TOTAL	WTHR	0.36100E+04	
FLOPS CONFIGURATION GEOMETRIC RATIOS, OBJ. FUNCTION, DESIGN VARIABLES			
DESIGN RANGE	DESRNG	0.50000E+04	(n.mi)
WING LOADING REQUIRED	WSR	0.11000E+03	
THRUST/WEIGHT REQUIRED	TWR	0.50000E+00	
HORIZ TAIL VOLUME COEF	HTVC	0.10000E+01	
VERT TAIL VOLUME COEF	VTVC	0.10000E+01	
RAMP WEIGHT	GWFLPS	0.70000E+06	(lbf)
WING ASPECT RATIO	ARFLPS	0.50000E+01	
WING TAPER RATIO	TRFLPS	0.08000E+00	
WING 1/4 CHORD SWEEP	SWEEP	0.31500E+02	(deg.)
WING THICKNESS-CHORD RATIO	TCA	0.06000E+00	
CRUISE MACH NUMBER	VCMN	0.80000E+00	
MAX CRUISE ALTITUDE	CH	0.40000E+05	(ft)
OBJ. FUN. WEIGHTING FACTOR	OFG	0.00000E+00	(GROSS WEIGHT)
OBJ. FUN. WEIGHTING FACTOR	OFF	0.00000E+00	(MISSION FUEL)
OBJ. FUN. WEIGHTING FACTOR	OFC	0.00000E+00	(COST)
FLOPS AERODYNAMIC OPTIONS AND APPROXIMATE TAKEOFF AND LANDING DATA			
WING TECHNOLOGY	AITEK	0.15000E+01	
FIXED DESIGN LIFT COEFFIC.	FCIDES	-0.10000E+01	
TURBULENT/LAMINAR FLOW	XLLAM	0.00000E+00	(1.0 FOR LAMINAR)

Listing of the neutral.add file (Continued)

FLOPS TAKEOFF AND LANDING DATA

MAX. LANDING/TAKEOFF WEIGHT WRATIO		0.81250E+00	
MAX. LANDING VELOCITY	VAPPR	0.15000E+03	(kts)
MAX. TAKEOFF FIELD LENGTH	FLTO	0.70000E+04	(ft)
MAX. LANDING FIELD LENGTH	FLLDG	0.70000E+04	(ft)
MAX. CL TAKEOFF CONFIG.	CLTOM	0.20000E+01	
MAX. CL LANDING CONFIG.	CLLDM	0.30000E+01	
AIR DENSITY RATIO	DRATIO	0.10000E+01	

FLOPS ENGINE DECK CONTROL, SCALING AND USAGE DATA

FLIGHT IDLE SWITCH	IDLE	1	
INDICATOR OF ENGINE DECK	IGENEN	-1	(-1 FOR EXTERNAL)
MIN IDLE FUEL FLOW FRACT	FIDMIN	0.80000E-01	
MAX IDLE FUEL FLOW FRACT	FIDMAX	0.10000E+01	
ENGINE DECK FILE NAME	EIFILE	nnepwate.missout	

FLOPS PERFORMANCE CONTROLS AND FACTORS AND MISSION SEGMENT DEFINITION

PRINT MISSION CONTROL	IFLAG	1	
DETAILED MISSION PRINT	MSUMPT	1	
FLAG FOR RAMP WEIGHT ESTIM.	IRW	1	
FUEL FLOW FACTOR	FACT	0.90000E+00	
CDO FACTOR	FCDO	0.10000E+01	
CDI FACTOR	FCDI	0.10000E+01	
OWE FACTOR	OWFACT	0.10000E+01	
RANGE TOLERANCE	RTOL	0.10000E+00	(n.mi)
ATA TRAFFIC ALLOWANCE	IATA	1	
WEIGHT INCREMENT	DWT	0.10000E+01	(lbf)

FLOPS GROUND OPERATIONS AND TAKEOFF INPUT

TAKEOFF TIME	TAKOTM	0.40000E+00	(min)
TAXI-OUT TIME	TAXOTM	0.10000E+02	(min)
TAXI-IN TIME	TAXITM	0.10000E+02	(min)
TAKEOFF POWER SETTING	ITTF	1	

FLOPS INPUT FOR 1 CLIMB SCHEDULES

MINIMUM CLIMB MACH NUMBER	CLMMIN	0.30000E+00	
MINIMUM CLIMB ALTITUDE	CLAMIN	0.00000E+00	(ft)
NUMBER OF CLIMB STEPS	NINCL	15	
CLIMB OPTIMIZATION FACTOR	FWF	-0.10000E+01	

FLOPS INPUT FOR 1 CRUISE SCHEDULES

CRUISE OPTION SWITCH	IOC	1	
MINIMUM MACH NUMBER	CRMMIN	0.70000E+00	

FLOPS INPUT FOR DESCENT SCHEDULE

MINIMUM DESCENT ALTITUDE	DEAMIN	0.00000E+00	(ft)
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FLOPS RESERVE SEGMENT INPUT

MISSED APPROACH TIME	TIMMAP	0.50000E+01	(min)
RESERVE HOLDING TIME	HOLDTM	0.30000E+02	(min)
2ND RES HOLD TIME OR FRAC	THOLD	0.50000E-01	(min)

FLOPS INPUT FOR DESCENT SCHEDULE

NUMBER OF DESCENT STEPS	NINDE	15	
MINIMUM DESCENT MACH NO.	DEMMIN	0.30000E+00	

FLOPS COST CALCULATION DATA

TYPE OF COST CALCULATION	ICOSTP	5	
R&D SWITCH	IRAD	1	
YEAR FOR CALCULATIONS	DYEAR	0.19870E+04	(year)
DEVELOPMENT START TIME	DEVST	0.19700E+04	(year)
FAA CERTIFICATION DATE	PLMQT	0.19800E+04	(year)
SPARES FACTOR FOR AIRFRAME	FAFMSP	0.10000E+00	
SPARES FACTOR FOR ENGINES	FENGSP	0.30000E+00	
AIRFRAME PRODUCTION QUANT.	Q	0.40000E+03	

Listing of the *neutral.add* file (Continued)

NO OF PROTOTYPE AIRCRAFT	NPROTP	2	
NO OF FLIGHT TEST AIRCRAFT	NFLTST	2	
SPARES FACTOR FOR DEVELOP.	FPPFT	0.50000E+00	
ENGINE PRESSURE RATIO	EPR	0.24200E+02	
FLOPS ENGINE DESIGN SFC	FLSFC	0.62000E+00	(lb/hr/lb)
MAX TURBINE INLET TEMP	TEMPUR	0.22820E+04	(deg. F)
BODY TYPE SWITCH	IBODY	1	
CIRCUIT INDICATOR	ICIRC	2	
AC TOTAL PACK FLOW	AC	0.33000E+03	(lb/min)
APU FLOW RATE	APUFLW	0.38500E+03	(lb/min)
APU SHAFT HORSEPOWER	APUSHP	0.17000E+03	(hp)
HYDRAULIC PUMP FLOW RATE	HYDGPM	0.15000E+03	(gal/min)
KVA RATING OF FULLTIME GENS	KVA	0.30000E+03	(kva)
NO OF APUS	NAPU	1	
NO OF AUTOPILOT CHANNELS	NCHAN	2	
NO OF INFLIGHTOPERATED GENS	NGEN	4	
MANUFACTURERS PROFIT RATE	PRORAT	0.15000E+02	(%)
DEPRECIATION PERIOD	DEPPER	0.14000E+02	(years)
FARE	FARE	0.09450E+00	(\$/pass/mile)
FUEL PRICE	FUELPR	0.50000E+00	(\$/gal)
TAX RATE FOR ROI CALCUL.	TAXRAT	0.33000E+00	
NO OF PODDED ENGINES	NPOD	2	
DIRECT LABOR BURDEN FACTOR	DLBUR	0.20000E+01	
NO OF YEARS FOR LCC CALCUL.	LIFE	0.14000E+02	(years)
RESIDUAL AT END OF DEPPER	RESID	0.15000E+02	(%)
RETURN ON INVESTMENT	ROI	0.70000E+01	(%)
LOAD FACTOR	LF	0.55000E+02	(%)
% OF SEATS FOR 1ST CLASS	PCTFC	0.10000E+02	(%)
MULTIPLEX INDICATOR	IMUX	1	(YES=0, NO=1)
AUXILIARY POWER INDICATOR	ISPOOL	1	(SINGLE=0, DOUBLE=1)

C.2 NNEPWATE Module: performs engine cycle analysis and weight estimation of the engine

The engine input and map files are prepared by the user prior to running T/BEST. The NNEPWATE module is executed independently of the neutral file. The NNEPPOST module updates the neutral file for output parameters obtained from NNEPWATE.

C.3 NNEPPOST Module: post-process the output from the NNEPWATE module

<u>Input Parameters</u>	<u>Output Parameters</u>																																																																																
None	<p>For FAN, HPC, LPC, HPT, and LPT:</p> <table> <tr><td>ENGINE COMPONENT TYPE: ---</td><td>NCC</td></tr> <tr><td>NUMBER OF STAGES</td><td>NSTAGE</td></tr> <tr><td>ROTOR SPEED</td><td>RPM</td></tr> <tr><td>MAXIMUM ROTOR SPEED</td><td>RPMAX</td></tr> <tr><td>BLADE TAPER RATIO (HUB/TIP)</td><td>TR</td></tr> <tr><td>UPSTREAM HUB RADIUS</td><td>RIUP1</td></tr> <tr><td>DOWNSTREAM HUB RADIUS</td><td>RIDW1</td></tr> <tr><td>UPSTREAM SHROUD RADIUS</td><td>ROUP1</td></tr> <tr><td>STAGE NUMBER</td><td>NS</td></tr> <tr><td>NUMBER OF BLADES</td><td>NB</td></tr> <tr><td>STAGE WEIGHT</td><td>NSTW</td></tr> <tr><td>HUB RADIUS</td><td>RHBA</td></tr> <tr><td>TIP RADIUS</td><td>RTBA</td></tr> <tr><td>ASPECT RATIO</td><td>AR</td></tr> <tr><td>MAXIMUM TEMPERATURE</td><td>TMAX</td></tr> <tr><td>STAGE LENGTH</td><td>STL</td></tr> <tr><td>1ST STATION CHORD LENGTH</td><td>CHORD (1)</td></tr> <tr><td>STAGE PRESSURE RATIO</td><td>PR</td></tr> <tr><td>STAGE PRESSURE</td><td>STAGEP</td></tr> <tr><td>STAGE TEMPERATURE</td><td>STAGET</td></tr> <tr><td>STAGE MASS FLOW RATE</td><td>STAGEF</td></tr> <tr><td>BLADE MATERIAL</td><td>MATSLC</td></tr> <tr><td>1ST STAGE WEIGHT FLOW RATE</td><td>XFLOW</td></tr> <tr><td>1ST STAG RELATIVE TIP SPEED</td><td>XVR</td></tr> <tr><td>1ST STAGE ROTATIVE RPM</td><td>XRPM</td></tr> <tr><td>1ST STA. ROT-STAT AXIAL GAP</td><td>XGAP</td></tr> <tr><td>1ST ROT-STA TIP AXIAL CHORD</td><td>XCHORD</td></tr> <tr><td>NOZZLE INNER RADIUS</td><td>RI</td></tr> <tr><td>NOZZLE OUTER RADIUS</td><td>RO</td></tr> </table> <p>For all other components:</p> <table> <tr><td>ENGINE COMPONENT TYPE: ----</td><td>NCC</td></tr> <tr><td>MATERIAL</td><td>CMPMAT</td></tr> <tr><td>PROCESS</td><td>TYPROC</td></tr> <tr><td>DUCT WEIGHT</td><td>WGHT</td></tr> <tr><td>STOCK MATERIAL WEIGHT</td><td>SWGHT</td></tr> <tr><td>MAURER WEIGHT FACTOR</td><td>MAURER</td></tr> <tr><td>COST TO MANUFACTURE ONE</td><td>COST1</td></tr> <tr><td>INNER RADIUS</td><td>RIN</td></tr> <tr><td>OUTER RADIUS</td><td>ROUT</td></tr> <tr><td>COMPONENT LENGTH</td><td>LENGTH</td></tr> <tr><td>SHAFT DN</td><td>DN</td></tr> </table>	ENGINE COMPONENT TYPE: ---	NCC	NUMBER OF STAGES	NSTAGE	ROTOR SPEED	RPM	MAXIMUM ROTOR SPEED	RPMAX	BLADE TAPER RATIO (HUB/TIP)	TR	UPSTREAM HUB RADIUS	RIUP1	DOWNSTREAM HUB RADIUS	RIDW1	UPSTREAM SHROUD RADIUS	ROUP1	STAGE NUMBER	NS	NUMBER OF BLADES	NB	STAGE WEIGHT	NSTW	HUB RADIUS	RHBA	TIP RADIUS	RTBA	ASPECT RATIO	AR	MAXIMUM TEMPERATURE	TMAX	STAGE LENGTH	STL	1ST STATION CHORD LENGTH	CHORD (1)	STAGE PRESSURE RATIO	PR	STAGE PRESSURE	STAGEP	STAGE TEMPERATURE	STAGET	STAGE MASS FLOW RATE	STAGEF	BLADE MATERIAL	MATSLC	1ST STAGE WEIGHT FLOW RATE	XFLOW	1ST STAG RELATIVE TIP SPEED	XVR	1ST STAGE ROTATIVE RPM	XRPM	1ST STA. ROT-STAT AXIAL GAP	XGAP	1ST ROT-STA TIP AXIAL CHORD	XCHORD	NOZZLE INNER RADIUS	RI	NOZZLE OUTER RADIUS	RO	ENGINE COMPONENT TYPE: ----	NCC	MATERIAL	CMPMAT	PROCESS	TYPROC	DUCT WEIGHT	WGHT	STOCK MATERIAL WEIGHT	SWGHT	MAURER WEIGHT FACTOR	MAURER	COST TO MANUFACTURE ONE	COST1	INNER RADIUS	RIN	OUTER RADIUS	ROUT	COMPONENT LENGTH	LENGTH	SHAFT DN	DN
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COMPONENT LENGTH	LENGTH																																																																																
SHAFT DN	DN																																																																																

Following the execution of NNEPPOST, the neutral file of the T/BEST executive system is generated. It appends the *neutral.add* file discussed in section C.1 and a section of defaulted parameters with the data from NNEPWATE to form *neutral.file*.. When executing NEUTGEN, the user may assign a specific value to any parameters in the neutral file. If a value is assigned to a parameter, than that value and the keyword of that parameter are stored in a file called *neutral.modify* in the T/BEST input directory. This file is read by NNEPPOST and the newly read values are assigned to the associated parameters when the neutral file is written.

List of *neutral.file* Default Parameters

BLADE BROACH ANGLE	BRANG	0.00000E+00	(deg.)
BLADE STAGGER ANGLE	STAGG	0.35000E+02	(deg.)
AIRCRAFT GROSS WEIGHT	GW	0.59696E+06	(lbs.)
AIRFRAME WEIGHT	AW	0.24832E+06	(lbs.)
CAPACITY WEIGHT	CW	0.16195E+06	(lbs.)
FUEL WEIGHT	FW	0.15659E+06	(lbs.)
CAPACITY+FUEL WEIGHT	TW	0.31854E+06	(lbs.)
NUMBER OF ENGINES	NE	4	
LANDING WEIGHT	WFF	0.00000E+00	(lbs.)
AIRCRAFT LIFT/DRAG RATIO	ALD	0.15810E+02	
INLET FLOW AREA	XAF	0.00000E+00	(sq. ft)
AFT DUCT AREA	XAR	0.00000E+00	(sq. ft.)
NOZZLE (PASSAGE) HEIGHT	XAH	0.00000E+00	(in.)
TEMPERATURE	XT	0.59000E+02	(F)
RELATIVE HUMIDITY	XRH	0.70000E+02	(%)
SIDELINE DISTANCE	XDIST	0.50000E+03	(ft.)
TARGET PERCEIVED NOISE LEV.	XPNL	0.90000E+02	(PNdB)
50 DEG.PERCEIVED NOISE LEV.	XPNDBF	0.00000E+00	(PNdB)
120DEG.PERCEIVED NOISE LEV.	XPNDBR	0.00000E+00	(PNdB)

C.4 BLASIMGEN Module: generates input for the BLASIM module

<u>Input Parameters</u>		<u>Output Parameters</u>
ENGINE COMPONENT TYPE: FAN	NCC	None
NUMBER OF STAGES	NSTAGE	
ROTOR SPEED	RPM	
MAXIMUM ROTOR SPEED	RPMAX	
BLADE TAPER RATIO (HUB/TIP)	TR	
UPSTREAM HUB RADIUS	RIUP1	
DOWNSTREAM HUB RADIUS	RIDW1	
UPSTREAM SHROUD RADIUS	ROUP1	
STAGE NUMBER	NS	
NUMBER OF BLADES	NB	
HUB RADIUS	RHBA	
TIP RADIUS	RTBA	
ASPECT RATIO	AR	
MAXIMUM TEMPERATURE	TMAX	
BLADE ROOT ANGLE	THER	
BLADE BROACH ANGLE	BRANG	
BLADE STAGGER ANGLE	STAGG	
1ST STATION CHORD LENGTH	CHORD(1)	
STAGE PRESSURE RATIO	PR	
BLADE MATERIAL	MATSLC	
AIRFOIL DEFINITION	AIRCODE	
FULL BLADE DEFINITION	ABLDEF	

C.5 BLASIM Module: performs structural analysis of the blade

The input to this module for all stages of each fan, compressor, and turbine is generated by the BLASIMGEN module. BLASIM is executed independently of the neutral file. Note that the BLASIM input generator and post-processor the carry out the data transfer with the T/BEST executive system.

C.6 BLASIMPOST Module:

post-process the output from the BLASIM module for each stage of fans, compressors and turbines.

<u>Input Parameters</u>		<u>Output Parameters</u>	
ENGINE COMPONENT TYPE: FAN	NCC	BLADE UNTWIST	UTWIST
NUMBER OF STAGES	NSTAGE	BLADE UNCAMBER	UCAMB
STAGE NUMBER	NS	MAXIMUM TIP EXTENSION	TIPX
ENGINE COMPONENT TYPE: HPC	NCC	MAX. IN PLANE Y-DISPL.	TIPY
NUMBER OF STAGES	NSTAGE	MAX. IN PLANE Z-DISPL.	TIPZ
STAGE NUMBER	NS	For next 5 modes	
ENGINE COMPONENT TYPE: LPC	NCC	FREQUENCY AT MIN. CRUISE	WMC1
NUMBER OF STAGES	NSTAGE	FREQUENCY AT ROTOR SPEED	w1
STAGE NUMBER	NS	FREQUENCY AT MAX. SPEED	WRL1
ENGINE COMPONENT TYPE: LPT	NCC	MAXIMUM RESONANCE MARGIN	MAXMR11
NUMBER OF STAGES	NSTAGE	MAXIMUM RESONANCE MARGIN	MAXMR12
STAGE NUMBER	NS	MAXIMUM RESONANCE MARGIN	MAXMR13
ENGINE COMPONENT TYPE: HPT	NCC	MAXIMUM RESONANCE MARGIN	MAXMR14
NUMBER OF STAGES	NSTAGE	MAXIMUM RESONANCE MARGIN	MAXMR15
STAGE NUMBER	NS	FREQUENCY AT MIN. CRUISE	WMC2
		MAX. MARGIN GOODMAN DIAG.	PMODE1
		MAX. MARGIN GOODMAN DIAG.	PMODE2
		MAX. MARGIN GOODMAN DIAG.	PMODE3
		MAX. MARGIN GOODMAN DIAG.	PMODE4
		MAX. MARGIN GOODMAN DIAG.	PMODE5
		ROOT STRESS	RSTRES
		MDE BLADE ROOT RESPONSE	FROOT
		BLADE WEIGHT	WGHT
		FOREIGN OBJECT VELOCITY	VELFOD
		FOREIGN OBJECT RADIUS	RADFOD
		IMPACT ANGLE	ANGFOD
		STAGGER ANGLE AT IMPACT	STAFOD
		FOREIGN OBJECT DENSITY	DENFOD
		IMPACT MAX. EDGE STRAIN	STRAIN
		IMPACT ROOT DAMAGE	ROOTD

C.7 MTSBGEN Module: generates input for the MTSB module

<u>Input Parameters</u>		<u>Output Parameters</u>
ENGINE COMPONENT TYPE: FAN	NCC	None
NUMBER OF STAGES	NSTAGE	
ROTOR SPEED	RPM	
BLADE TAPER RATIO (HUB/TIP)	TR	
UPSTREAM HUB RADIUS	RIUP1	
DOWNSTREAM HUB RADIUS	RIDW1	
UPSTREAM SHROUD RADIUS	ROUP1	
STAGE NUMBER	NS	
NUMBER OF BLADES	NB	
STAGE WEIGHT	NSTW	
HUB RADIUS	RHBA	
TIP RADIUS	RTBA	
ASPECT RATIO	AR	
MAXIMUM TEMPERATURE	TMAX	
BLADE ROOT ANGLE	THER	
STAGE LENGTH	STL	
1ST STATION CHORD LENGTH	CHORD (1)	
STAGE PRESSURE RATIO	PR	
STAGE PRESSURE	STAGEP	
STAGE TEMPERATURE	STAGET	
STAGE MASS FLOW RATE	STAGEF	
AIRFOIL DEFINITION	AIRCODE	

C.8 MTSB Module: transonic flow solution

The MTSB input file for all stages of each fan, compressor, and turbine is generated by the MTSBGEN module. MTSB is executed independently of the neutral file. The input generator and post-processor of the MTSB module access the T/BEST neutral file to retrieve/update parameters.

C.9 MTSBPOST Module: post-process the output from the mtsb module for each stage of fans, compressors and turbines

<u>Input Parameters</u>		<u>Output Parameters</u>	
ENGINE COMPONENT TYPE: FAN	NCC	EFFICIENCY (KINETIC)	EFNCY
NUMBER OF STAGES	NSTAGE	PROFILE EFFICIENCY	EPROF
STAGE NUMBER	NS	ENDWALL EFFICIENCY	ENDWA
ENGINE COMPONENT TYPE: HPC	NCC	SEC. LOSS EFFICIENCY	ESECL
NUMBER OF STAGES	NSTAGE	INCIDENCE EFFICIENCY	EINCD
STAGE NUMBER	NS	CLEARANCE EFFICIENCY	ECLEA
ENGINE COMPONENT TYPE: LPC	NCC	WINDAGE EFFICIENCY	EWIND
NUMBER OF STAGES	NSTAGE	SUM ROTOR EFFICIENCY	ESUMR
STAGE NUMBER	NS		
ENGINE COMPONENT TYPE: LPT	NCC		
NUMBER OF STAGES	NSTAGE		
STAGE NUMBER	NS		
ENGINE COMPONENT TYPE: HPT	NCC		
NUMBER OF STAGES	NSTAGE		
STAGE NUMBER	NS		

C.10 NOISE Module: estimates the fan tone, broadband and jet noise

<u>Input Parameters</u>		<u>Output Parameters</u>	
1ST STAGE WEIGHT FLOW RATE	XFLOW	50 DEG.PERCEIVED NOISE LEV.	XPNDBF
1ST STAG RELATIVE TIP SPEED	XVR	120DEG.PERCEIVED NOISE LEV.	XPNDBR
1ST STAGE ROTATIVE RPM	XRPM		
1ST STA. ROT-STAT AXIAL GAP	XGAP		
1ST ROT-STA TIP AXIAL CHORD	XCHORD		
INLET FLOW AREA	XAF		
AFT DUCT AREA	XAR		
NOZZLE INNER RADIUS	RI		
NOZZLE OUTER RADIUS	RO		
NOZZLE (PASSAGE) HEIGHT	XAH		
TEMPERATURE	XT		
RELATIVE HUMIDITY	XRH		
SIDELINE DISTANCE	XDIST		
TARGET PERCEIVED NOISE LEV.	XPNL		
ENGINE COMPONENT TYPE: FAN	NCC		
STAGE NUMBER	NS -1		
NUMBER OF BLADES	NB		
HUB RADIUS	RHBA		
TIP RADIUS	RTBA		
1ST STATION CHORD LENGTH	CHORD (1)		
JET VELOCITY	XVJ		

C.11 PREDICT Module: predicts gross, airframe, engine, capacity and fuel weights

<u>Input Parameters</u>		<u>Output Parameters</u>	
AIRCRAFT GROSS WEIGHT	GW	AIRCRAFT GROSS WEIGHT	GW
AIRFRAME WEIGHT	AW	AIRFRAME WEIGHT	AW
CAPACITY WEIGHT	CW	CAPACITY WEIGHT	CW
FUEL WEIGHT	FW	FUEL WEIGHT	FW
CAPACITY+FUEL WEIGHT	TW	CAPACITY+FUEL WEIGHT	TW
WEIGHT OF BARE ENGINE	EN	WEIGHT OF BARE ENGINE	EN
WEIGHT OF ENGINE ACESSORIES	EA	WEIGHT OF ENGINE ACESSORIES	EA
FUEL CONSUMED AT CRUISE	FCR		

C.12 RANGE Module: computes the cruise-climb range

<u>Input Parameters</u>		<u>Output Parameters</u>	
AIRCRAFT GROSS WEIGHT	GW	AIRCRAFT LIFT/DRAG RATIO	ALD
FUEL WEIGHT	FW	CRUISE ALTITUDE	ALT
LANDING WEIGHT	WFF	CRUISE SPEED	VC
AIRCRAFT LIFT/DRAG RATIO	ALD	CRUISE SPECIFIC FUEL CONSUMP	SFCC
CRUISE ALTITUDE	ALT	CRUISE THRUST	ATC
ALTITUDE	CALT	RANGE	RANGE
SPEED	V	BREGUET RANGE	BRANGE
GROSS THRUST	AT		
SPECIFIC FUEL CONSUMPT.	SFC		

C.13 CITY Module: estimates the number of city pairs in the US. and Western Europe.

<u>Input Parameters</u>		<u>Output Parameters</u>	
RANGE	RANGE	U. S. CITY PAIRS WESTERN EUROPE CITY PAIRS	USCITY INTCITY

C.14 REPAIR Module: computes mean time between engine repair,
material, and labor

<u>Input Parameters</u>		<u>Output Parameters</u>	
ALTITUDE	CALT	TIME BETWEEN ENG. OVERHAULS	HEO
PRESSURE AT INLET	PFAN1	HIGH PRESSURE COMPRES MTBR	HCMTBR
TEMPERATURE AT INLET	TFAN1	INLET MEAN TIME REPAIR	INMTBR
PRESSURE AT INLET	PLPC1	DUCT MEAN TIME REPAIR	DUMTBR
TEMPERATURE AT INLET	TLPC1	BURNER MEAN TIME REPAIR	BUMTBR
PRESSURE AT EXIT	PFAN2	AUGMENTER MEAN TIME REPAIR	AUMTBR
TEMPERATURE AT EXIT	TFAN2	MIXER MEAN TIME REPAIR	FMMTBR
PRESSURE AT EXIT	PHPC2	NOZZLE MEAN TIME REPAIR	NOMTBR
TEMPERATURE AT EXIT	THPC2	SHAFT MEAN TIME REPAIR	SHMTBR
PRESSURE AT EXIT	PPBU2	DIFFUSER MTBR	DIFMTBR
TEMPERATURE AT EXIT	TPBU2	COMBUSTOR MTBR	CBMTBR
PRESSURE AT EXIT	PHPT2	HIGH PRESSURE TURBINE MTBR	HTMTBR
TEMPERATURE AT EXIT	THPT2	LOW PRESSURE TURBINE MTBR	LTMTBR
PRESSURE AT EXIT	PLPT2	LOW PRESSURE COMPRESS LABOR	LCHOURS
TEMPERATURE AT EXIT	TLPT2	HIGH PRESSURE COMPRES LABOR	HCHOURS
CRUISE ALTITUDE	ALT	INLET LABOR	INHOURS
ENGINE COMPONENT TYPE: FAN	NCC	DUCT LABOR	DUHOURS
NUMBER OF STAGES	NSTAGE	BURNER LABOR	BUHOURS
ROTOR SPEED	RPM	AUGMENTER LABOR	AUHOURS
STAGE NUMBER	NS	MIXER LABOR	FMHOURS
TIP RADIUS	RTBA	NOZZLE LABOR	NOHOURS
ENGINE COMPONENT TYPE: LPC	NCC	SHAFT LABOR	SHHOURS
NUMBER OF STAGES	NSTAGE	DIFFUSER LABOR	DIFHOURS
ROTOR SPEED	RPM	COMBUSTOR LABOR	CBHOURS
STAGE NUMBER	NS	HIGH PRESSURE TURBINE LABOR	HTHOURS
TIP RADIUS	RTBA	LOW PRESSURE TURBINE LABOR	LTHOURS
ENGINE COMPONENT TYPE: HPC	NCC	LPC MATERIALS COST	LCCOST
NUMBER OF STAGES	NSTAGE	HPC MATERIALS COST	HCCOST
ROTOR SPEED	RPM	INLET MATERIALS COST	INCCOST
STAGE NUMBER	NS	DUCT MATERIALS COST	DUCCOST
TIP RADIUS	RTBA	BURNER MATERIALS COST	BUCOST
ENGINE COMPONENT TYPE: HPT	NCC	AUGMENTER MATERIALS COST	AUCOST
NUMBER OF STAGES	NSTAGE	MIXER MATERIALS COST	FMCCOST
ROTOR SPEED	RPM	NOZZLE MATERIALS COST	NOCOST
STAGE NUMBER	NS	SHAFT MATERIALS COST	SHCCOST
TIP RADIUS	RTBA	DIFFUSER MATERIALS COST	DIFCCOST
ENGINE COMPONENT TYPE: LPT	NCC	COMBUSTOR MATERIALS COS	CBCCOST
NUMBER OF STAGES	NSTAGE	HPT MATERIALS COST	HTCCOST
ROTOR SPEED	RPM	LPT MATERIALS COST	LTCOST
STAGE NUMBER	NS		
TIP RADIUS	RTBA		
NUMBER OF ENGINES	NE		
TIME BETWEEN ENG. OVERHAULS	HEO		
LOW PRESSURE COMPRESS PRICE	LCPRICE		
HIGH PRESSURE COMPRES PRICE	HCPRICE		
INLET PRICE	INPRICE		
DUCT PRICE	DUPRICE		
BURNER PRICE	BUPRICE		
AUGMENTER PRICE	AUPRICE		
MIXER PRICE	FMPRICE		
NOZZLE PRICE	NOPRICE		
SHAFT PRICE	SHPRICE		
DIFFUSER PRICE	DIFPRICE		
COMBUSTOR PRICE	CBPRICE		
HIGH PRESSURE TURBINE PRICE	HTPRICE		
LOW PRESSURE TURBINE PRICE	LTPRICE		

C.15 DOC Module:

computes direct operating cost

<u>Input Parameters</u>		<u>Output Parameters</u>	
AIRCRAFT GROSS WEIGHT	GW	AIRCRAFT GROSS WEIGHT	GW
AIRFRAME WEIGHT	AW	AIRFRAME WEIGHT	AW
FUEL WEIGHT	FW	FUEL WEIGHT	FW
WEIGHT OF BARE ENGINE	EN	WEIGHT OF BARE ENGINE	EN
ALTITUDE	CALT	ALTITUDE	CALT
INSTALLED THRUST	ATI	INSTALLED THRUST	ATI
SPEED	V	SPEED	V
SPECIFIC FUEL CONSUMPT.	SFC	SPECIFIC FUEL CONSUMPT.	SFC
CRUISE ALTITUDE	ALT	CRUISE ALTITUDE	ALT
RANGE	RANGE	RANGE	RANGE
TIME TO CLIMB	TC	TIME TO CLIMB	TC
TIME TO DECEND	TD	TIME TO DECEND	TD
DAY NITE FACTOR	DNF	DAY NITE FACTOR	DNF
SPARE PARTS FACTOR	SPF	SPARE PARTS FACTOR	SPF
CAPTAIN'S PAY	ODPP	CAPTAIN'S PAY	ODPP
COPILOT'S PAY	ODPCP	COPILOT'S PAY	ODPCP
FLIGHT'S ENGINEER PAY	ODPFE	FLIGHT'S ENGINEER PAY	ODPFE
DOMESTIC TRAVEL FACTOR	ED	DOMESTIC TRAVEL FACTOR	ED
INTERNATIONAL TAVEL FACTOR	EI	INTERNATIONAL TAVEL FACTOR	EI
TRAINING FACTOR	KT	TRAINING FACTOR	KT
VACATION FACTOR	KV	VACATION FACTOR	KV
CREW PREMIUM FACTOR	KP	CREW PREMIUM FACTOR	KP
PAYROLL TAX FACTOR	KI	PAYROLL TAX FACTOR	KI
ANNUAL FLIGHT HOURS (U.S.A)	AHD	ANNUAL FLIGHT HOURS (U.S.A)	AHD
ANNUAL FLIGHT HOURS (INT.)	AHI	ANNUAL FLIGHT HOURS (INT.)	AHI
CAPTAIN'S BASE PAY	BPP	CAPTAIN'S BASE PAY	BPP
1ST OFFICER'S BASE PAY	BPCP	1ST OFFICER'S BASE PAY	BPCP
FLIGHT ENGINEER'S BASE PAY	BPFE	FLIGHT ENGINEER'S BASE PAY	BPFE
FUEL COST (USA)	AFUELD	FUEL COST (USA)	AFUELD
FUEL COST (INTERNATIONAL)	AFUELI	FUEL COST (INTERNATIONAL)	AFUELI
JET OIL COST (US)	BOILTD	JET OIL COST (US)	BOILTD
JET OIL COST (INT.)	BOILTI	JET OIL COST (INT.)	BOILTI
ENGINE OIL (US)	BOILRD	ENGINE OIL (US)	BOILRD
ENGINE OIL (INT.)	BOILRI	ENGINE OIL (INT.)	BOILRI
FUEL CONSUMED AT CRUISE	FCR	FUEL CONSUMED AT CRUISE	FCR
FUEL USED IN CLIMB	FCL	FUEL USED IN CLIMB	FCL
FUEL USED IN DESCENT	FD	FUEL USED IN DESCENT	FD
FUEL FOR GROUND MANEUVERS	FGM	FUEL FOR GROUND MANEUVERS	FGM
DISTANCE FOR CLIMB	DC	DISTANCE FOR CLIMB	DC
DISTANCE DESCENT	DD	DISTANCE DESCENT	DD
MANEUVERING DISTANCE	DAM	MANEUVERING DISTANCE	DAM
COST OF COMPLETE AIRPLANE	CT	COST OF COMPLETE AIRPLANE	CT
COST OF AIRPLANE LESS ENG.	CSPA	COST OF AIRPLANE LESS ENG.	CSPA
COST OF AIR. LESS ENG,PROP	CA	COST OF AIR. LESS ENG,PROP	CA
COST OF ONE ENGINE	CE	COST OF ONE ENGINE	CE
COST OF ONE PROP	CP	COST OF ONE PROP	CP
NUMBER OF PROPS	ANP	NUMBER OF PROPS	ANP
TIME BETWEEN ENG. OVERHAULS	HEO	TIME BETWEEN ENG. OVERHAULS	HEO
TAKEOFF EQUIV. HORSE POWER	ESHP	TAKEOFF EQUIV. HORSE POWER	ESHP
DENSITY OF FUEL	WF	DENSITY OF FUEL	WF
DENSITY OF OIL	WO	DENSITY OF OIL	WO
INSURANCE RATE DOLLAR/VALUE	AIRA	INSURANCE RATE DOLLAR/VALUE	AIRA
INSURANCE: LIABILITY&DAMAGE	PLPD	INSURANCE: LIABILITY&DAMAGE	PLPD
LABOR COST	RL	LABOR COST	RL
AIRPLANE DEPRECIAT. FACTOR	AKDA	AIRPLANE DEPRECIAT. FACTOR	AKDA

Input Parameters (Continued)

ENGINE DEPRECIATION FACTOR	AKDE
PROP DEPRECIATION FACTOR	AKDP
SPARE AIRPLANE DEPRECIATION	AKDSA
SPARE ENGINE DEPRECIATION	AKDSE
AIRFRAME DEPRECIATION	DA
ENGINE DEPRECIATION	DE
PROP DEPRECIATION	DP
SPARE AIRFRAME DEPRECIATION	DAS
SPARE ENGINE DEPRECIATION	DES
AIRPLANE SPARES/AIR. PRICE	AKSPA
ENGINE SPARES/ENGINE PRICE	AKSPE

Output Parameters (Continued)

ENGINE DEPRECIATION FACTOR	AKDE
PROP DEPRECIATION FACTOR	AKDP
SPARE AIRPLANE DEPRECIATION	AKDSA
SPARE ENGINE DEPRECIATION	AKDSE
AIRFRAME DEPRECIATION	DA
ENGINE DEPRECIATION	DE
PROP DEPRECIATION	DP
SPARE AIRFRAME DEPRECIATION	DAS
SPARE ENGINE DEPRECIATION	DES
AIRPLANE SPARES/AIR. PRICE	AKSPA
ENGINE SPARES/ENGINE PRICE	AKSPE
BLOCK FUEL	FB
CAPTAIN GROSS WEIGHT FACTOR	GWFP
1ST OF. GROSS WEIGHT FACTOR	GWFCP
FLT. ENG. GROSS WT. FACTOR	GWFFE
CAPTAIN MILEAGE RATE FACTOR	XMRFP
1ST OF. MILEAGE RATE FACTOR	XMRCP
FLT ENG MILEAGE RATE FACTOR	XMRFE
TIME TO CRUISE DOMESTIC	TGD
GROUND MANUEVERING TIME	TGM
DOMESTIC BLOCK TIME	TBD
DOMESTIC BLOCK SPEED	VBD
DOM. TURBINE AIRCRAFT UTIL.	UTD
DOM. RECP. ENG. AIR. UTIL.	URD
INTERNATIONAL BLOCK SPEED	VBI
INTERNATIONAL BLOCK TIME	TBI
TIME TO CRUISE INTERNAT.	TGI
INT TURBINE AIR. UTILIZAION	UTI
INT RECP. ENG. AIR. UTIL.	URI
CAPTAINS DOMESTIC COST	CAMPD
1S OFFICERS DOMESTIC COST	CAMCPD
FLIGHT ENG. DOMESTIC COST	CAMFED
DOMESTIC FUEL COST	CFTD
DOMESTIC OIL COST	COTD
DOMESTIC INSURANCE COSTS	CINTD
DOM TURB AIRFR LABOR COST	ALBD
DOM TURB AIRFR BURDEN COST	ALBTDMB
DOM REC ENG AIR LABOR COST	ALBRD
DOM REC ENG BURDEN COST	ALBRDMB
DOM TURB ENG LABOR MAINT.	ELBD
DOM TURB ENG BURDEN COST	ELBTDMB
DOM TURBPROP ENG LABOR MAIN	ELBPD
DOM TURBPROP ENG BURDEN	ELBPDMB
DOM REC ENG. LABOR MAINT.	ELBRD
DOM REC ENG MAINT BURDEN	ELBRDMB
DOM TURB ENG AIR MAINT MATE	CMATD
DOM TURB ENG AIR MAINT BURD	CMATDMB
DOM REC ENG AIR MAINT MATE	CMARD
DOM REC ENG AIR MAINT BURD	CMARDMB
DOM TURB ENG MAINT MATERIAL	CMETD
DOM TURB ENG MAINT BURDEN	CMETDMB
DOM REC ENG MAINT MATERIALS	CMERD
DOM REC ENG MAINT BURDEN	CMERDMB
DOM TURB AIR APP MAINT BURD	CMBTD
DOM REC ENG AIR APP BURDEN	CMBRD
DOM TURBPROP AIR. APP. BURD	CMBPD

Output Parameters (Continued)

DOM TURB AIR DEPRECIATION	CDATD
DOM REC ENG AIRCRAFT DEPREC	CDARD
DOM TURB ENG DEPRECIATION	CDET
DOM. REC. ENG DEPRECIATION	CDERD
DOM SPARE TURB AIR. DEPRECI	DSATD
DOM SPARE REC ENG AIR DEPRE	DSARD
DOM. SPARE TURB ENG DEPRECI	DSETD
DOM. SPARE REC. ENG DEPRECI	DSERD
DOM. SPARE PROP DEPRECIATIO	CDPD
INTERNATIONAL FUEL COSTS	CFTI
INTERNATIONAL OIL COSTS	COTI
INTERNATIONAL INSURANCE	CINTI
INT. TURB AIRFRAME LABOR	ALBTI
INT. REC. ENG. AIR LABOR	ALBRI
INT. TURB ENG LABOR MAINT	ELBTI
INT TURBPROP ENG. LABOR MAI	ELBPI
INT REC ENG LABOR MAINTENAN	ELBRI
INT TURB ENG AIR MAIN MATER	CMATI
INT REC ENG AIR MAINT MATER	CMARI
INT TURB ENG MAINT MATERIAL	CMETI
INT REC ENG MAINT MATERIALS	CMERI
INT TURB AIR APP MAINT BURD	CMBTD
INT REC ENG AIR APP BURD	CMBRD
INT. TURBOPROP AIR APP BURD	CMBPD
INT. TURB AIR DEPRECIATION	CDATI
INT REC ENG AIR DEPRECIATIO	CDARI
INT TURB ENG DEPRECIATION	CDETI
INT. REC. ENG DEPRECIATION	CDERI
INT. SPARE TURB. AIR DEPREC	DSATI
INT SPARE REC ENG AIR DEPR	DSARI
INT. SPARE TURB ENG DEPRECI	DSETI
INT. SPARE REC. ENG DEPRECI	DSERI
INT. SPARE PROP DEPRECIATIO	CDPI

C.16 LCC Module:

estimates engine maintenance cost for a year of service

<u>Input Parameters</u>		<u>Output Parameters</u>	
NUMBER OF ENGINES	NE	NEW JET/FAN MAIN. COST 1YR	NEWT1
ANNUAL FLIGHT HOURS (U.S.A)	AHD	DERIVATIVE JET/FAN ENG 1YR	DETT1
GROUND MANUEVERING TIME	TGM	NEW JET/FAN MAIN. COST 2YR	NEWT2
DOMESTIC BLOCK TIME	TBD	DERIVATIVE JET/FAN ENG 2YR	DETT2
DOMESTIC BLOCK SPEED	VBD	NEW JET/FAN MAIN. COST 3YR	NEWT3
DOM TURB ENG LABOR MAINT.	ELBD	DERIVATIVE JET/FAN ENG 3YR	DETT3
DOM TURB ENG BURDEN COST	ELBTDMB	NEW JET/FAN MAIN. COST 4YR	NEWT4
DOM TURBPROP ENG LABOR MAIN	ELBPD	DERIVATIVE JET/FAN ENG 4YR	DETT4
DOM TURBPROP ENG BURDEN	ELBPDMB	NEW JET/FAN MAIN. COST 5YR	NEWT5
DOM REC ENG. LABOR MAINT.	ELBRD	DERIVATIVE JET/FAN ENG 5YR	DETT5
DOM REC ENG MAINT BURDEN	ELBRDMB	NEW JET/FAN MAIN. COST 6YR	NEWT6
DOM TURB ENG MAINT MATERIAL	CMETD	DERIVATIVE JET/FAN ENG 6YR	DETT6
DOM TURB ENG MAINT BURDEN	CMETDMB	NEW JET/FAN MAIN. COST 7YR	NEWT7
DOM REC ENG MAINT MATERIALS	CMERD	DERIVATIVE JET/FAN ENG 7YR	DETT7
DOM REC ENG MAINT BURDEN	CMERDMB	NEW JET/FAN MAIN. COST 8YR	NEWT8
		DERIVATIVE JET/FAN ENG 8YR	DETT8
		NEW JET/FAN MAIN. COST 9YR	NEWT9
		DERIVATIVE JET/FAN ENG 9YR	DETT9
		NEW JET/FAN MAIN. COST 10YR	NEWT10
		DERIVATIVE JET/FAN ENG 10YR	DETT10
		NEW JET/FAN MAIN. COST 11YR	NEWT11
		DERIVATIVE JET/FAN ENG 11YR	DETT11
		NEW JET/FAN MAIN. COST 12YR	NEWT12
		DERIVATIVE JET/FAN ENG 12YR	DETT12
		NEW JET/FAN 8YR TOTAL	NEWTJET
		DERIVATIVE JET/FAN 8YR TOTA	DETTJET
		NEW TURPROP MAIN. COST 1YR	NEWP1
		DERIVATIVE JET/FAN ENG 1YR	DERP1
		NEW TURPROP MAIN. COST 2YR	NEWP2
		DERIVATIVE JET/FAN ENG 2YR	DERP2
		NEW TURPROP MAIN. COST 3YR	NEWP3
		DERIVATIVE JET/FAN ENG 3YR	DERP3
		NEW TURPROP MAIN. COST 4YR	NEWP4
		DERIVATIVE JET/FAN ENG 4YR	DERP4
		NEW TURPROP MAIN. COST 5YR	NEWP5
		DERIVATIVE JET/FAN ENG 5YR	DERP5
		NEW TURPROP MAIN. COST 6YR	NEWP6
		DERIVATIVE JET/FAN ENG 6YR	DERP6
		NEW TURPROP MAIN. COST 7YR	NEWP7
		DERIVATIVE JET/FAN ENG 7YR	DERP7
		NEW TURPROP MAIN. COST 8YR	NEWP8
		DERIVATIVE JET/FAN ENG 8YR	DERP8
		NEW TURPROP MAIN. COST 9YR	NEWP9
		DERIVATIVE JET/FAN ENG 9YR	DERP9
		NEW TURPROP MAIN. COST 10YR	NEWP10
		DERIVATIVE JET/FAN ENG 10YR	DERP10
		NEW TURPROP MAIN. COST 11YR	NEWP11
		DERIVATIVE JET/FAN ENG 11YR	DERP11
		NEW TURPROP MAIN. COST 12YR	NEWP12
		DERIVATIVE JET/FAN ENG 12YR	DERP12
		NEW RECIENG 8YR TOTAL	NEWPJET
		DERIVATIVE RECIENG 8YR TOTA	DERPJET
		NEW RECIENG MAIN. COST 1YR	NEWR1
		DERIVATIVE RECIENG ENG 1YR	DERR1
		NEW RECIENG MAIN. COST 2YR	NEWR2
		DERIVATIVE RECIENG ENG 2YR	DERR2

Output Parameters (Continued)

NEW RECIENG MAIN. COST 3YR	NEWR3
DERIVATIVE RECIENG ENG 3YR	DERR3
NEW RECIENG MAIN. COST 4YR	NEWR4
DERIVATIVE RECIENG ENG 4YR	DERR4
NEW RECIENG MAIN. COST 5YR	NEWR5
DERIVATIVE RECIENG ENG 5YR	DERR5
NEW RECIENG MAIN. COST 6YR	NEWR6
DERIVATIVE RECIENG ENG 6YR	DERR6
NEW RECIENG MAIN. COST 7YR	NEWR7
DERIVATIVE RECIENG ENG 7YR	DERR7
NEW RECIENG MAIN. COST 8YR	NEWR8
DERIVATIVE RECIENG ENG 8YR	DERR8
NEW RECIENG MAIN. COST 9YR	NEWR9
DERIVATIVE RECIENG ENG 9YR	DERR9
NEW RECIENG MAIN. COST 10YR	NEWR10
DERIVATIVE RECIENG ENG 10YR	DERR10
NEW RECIENG MAIN. COST 11YR	NEWR11
DERIVATIVE RECIENG ENG 11YR	DERR11
NEW RECIENG MAIN. COST 12YR	NEWR12
DERIVATIVE RECIENG ENG 12YR	DERR12
NEW RECIENG 8YR TOTAL	NEWRENG
DERIVATIVE RECIENG 8YR TOTA	DERRENG

C.17 FLOPSGEN Module:

generates input for the FLOPS module

<u>Input Parameters</u>		<u>Output Parameters</u>	
AIRCRAFT GROSS WEIGHT	GW	FLOPS PROBLEM TYPE	IOPT
WEIGHT of BARE ENGINE	EN	FLOPS ANALYSIS OPTION	IANAL
ESTIMATED TOTAL LENGTH	TLEN	FLOPS COST ANALYSIS FLAG	ICOST
ESTIMATED MAXIMUM RADIUS	RADMAX	STRUCTURAL ULTIMATE LOAD	ULF
NUMBER OF ENGINES	NE	DIHEDRAL (POSITIVE)	DIH
CRUISE ALTITUDE	ALT	AREA	SHT
CRUISE SPEED	VC	1/4 CHORD SWEEP ANGLE	SWPHT
CRUISE THRUST	ATC	ASPECT RATIO	ARHT
RANGE	RANGE	TAPER RATIO	TRHT
		T/C	TCHT
		LOCATION ON VERTICAL TAIL	HHT
		NUMBER OF VERTICAL TAILS	NVERT
		AREA	SVT
		1/4 CHORD SWEEP ANGLE	SWPVT
		ASPECT RATIO	ARVT
		TAPER RATIO	TRVT
		T/C	TCVT
		NUMBER OF FUSELAGES	NFUSE
		TOTAL LENGTH	XL
		MAXIMUM WIDTH	WF
		MAXIMUM DEPTH	DF
		CARGO AIRCRAFT FACTOR	CARGF
		PASSENGER COMPART LENGTH	XLP
		LENGTH OF MAIN GEAR	XMLG
		LENGTH OF NOSE GEAR	XNLG
		CARRIER BASED AIRCRAFT	CARBAS
		NUMBER OF ENGINES ON WING	NEW
		NUMBER OF ENGINES ON FUSE	NEF
		BASELINE ENGINE THRUST	THRSO
		BASELINE ENGINE WEIGHT	WENG
		WEIGHT SCALING PARAMETER	EEXP
		BASELINE NACELLE LENGTH	XNAC
		BASELINE NACELLE DIAMETER	DNAC
		FUEL CAPACITY OF WING	FULWMX
		FUEL CAPACITY OF FUSELAGE	FULFMX
		AUX. TANK FUEL CAPACITY	FULAUX
		NUMBER OF FUEL TANKS	NTANK
		ADDED MISC PROP SYSTEM WT	WPMISC
		FIRST CLASS PASSENGERS	NPF
		TOURIST PASSENGERS	NPT
		STEWARDESSES	NSTU
		GALLEY CREW	NGALC
		FLIGHT CREW	NFLCR
		WEIGHT PER PASSENGER	WPPASS
		BAGGAGE PER PASSENGER	BPP
		THRUST REVERSERS - TOTAL	WTHR
		DESIGN RANGE	DESRNG
		WING LOADING REQUIRED	WSR
		THRUST/WEIGHT REQUIRED	TWR
		HORIZ TAIL VOLUME COEF	HTVC
		VERT TAIL VOLUME COEF	VTVC
		RAMP WEIGHT	GWFLOPS
		WING ASPECT RATIO	ARFLOPS
		WING TAPER RATIO	TRFLOPS
		WING 1/4 CHORD SWEEP	SWEEP
		WING THICKNESS-CHORD RATIO	TCA

Output Parameters (Continued)

CRUISE MACH NUMBER	VCMN
MAX CRUISE ALTITUDE	CH
OBJ. FUN. WEIGHTING FACTOR	OFG
OBJ. FUN. WEIGHTING FACTOR	OFF
OBJ. FUN. WEIGHTING FACTOR	OFC
WING TECHNOLOGY	AITEK
FIXED DESIGN LIFT COEFFIC.	FCLDES
TURBULENT/LAMINAR FLOW	XLLAM
MAX. LANDING/TAKEOFF WEIGHT	WRATIO
MAX. LANDING VELOCITY	VAPPR
MAX. TAKEOFF FIELD LENGTH	FLTO
MAX. LANDING FIELD LENGTH	FLLDG
MAX. CL TAKEOFF CONFIG.	CLTOM
MAX. CL LANDING CONFIG.	CLLDM
AIR DENSITY RATIO	DRATIO
FLIGHT IDLE SWITCH	IDLE
INDICATOR OF ENGINE DECK	IGENEN
MIN IDLE FUEL FLOW FRACT	FIDMIN
MAX IDLE FUEL FLOW FRACT	FIDMAX
ENGINE DECK FILE NAME	EIFILE
PRINT MISSION CONTROL	IFLAG
DETAILED MISSION PRINT	MSUMPT
FLAG FOR RAMP WEIGHT ESTIM.	IRW
FUEL FLOW FACTOR	FACT
CDO FACTOR	FCDO
CDI FACTOR	FCDI
OWE FACTOR	OWFACT
RANGE TOLERANCE	RTOL
ATA TRAFFIC ALLOWANCE	IATA
WEIGHT INCREMENT	DWT
TAKEOFF TIME	TAKOTM
TAXI-OUT TIME	TAXOTM
TAXI-IN TIME	TAXITM
TAKEOFF POWER SETTING	ITTF
MINIMUM CLIMB MACH NUMBER	CLMMIN
MINIMUM CLIMB ALTITUDE	CLAMIN
NUMBER OF CLIMB STEPS	NINCL
CLIMB OPTIMIZATION FACTOR	FWF
CRUISE OPTION SWITCH	IOC
MINIMUM MACH NUMBER	CRMMIN
MINIMUM DESCENT ALTITUDE	DEAMIN
MISSED APPROACH TIME	TIMMAP
RESERVE HOLDING TIME	HOLDTM
2ND RES HOLD TIME OR FRAC	THOLD
NUMBER OF DESCENT STEPS	NINDE
MINIMUM DESCENT MACH NO.	DEMMIN
WEIGHT COMPUTATION OPTION	MYWTS
DESIGN RANGE	DESRNG2
REQUIRED WING LOADING	WSR2
REQUIRED THRUST/WEIGHT	TWR2
TYPE OF COST CALCULATION	ICOSTP
R&D SWITCH	IRAD
YEAR FOR CALCULATIONS	DYEAR
DEVELOPMENT START TIME	DEVST
FAA CERTIFICATION DATE	PLMQT
SPARES FACTOR FOR AIRFRAME	FAFMSP
SPARES FACTOR FOR ENGINES	FENGSP
AIRFRAME PRODUCTION QUANT.	Q
NO OF PROTOTYPE AIRCRAFT	NPROTP

Output Parameters (Continued)

NO OF FLIGHT TEST AIRCRAFT	NFLTST
SPARES FACTOR FOR DEVELOP.	FPPFT
ENGINE PRESSURE RATIO	EPR
FLOPS ENGINE DESIGN SFC	FLSFC
MAX TURBINE INLET TEMP	TEMPTUR
BODY TYPE SWITCH	IBODY
CIRCUIT INDICATOR	ICIRC
AC TOTAL PACK FLOW	AC
APU FLOW RATE	APUFLW
APU SHAFT HORSEPOWER	APUSHP
HYDRAULIC PUMP FLOW RATE	HYDGPM
KVA RATING OF FULLTIME GENS	KVA
NO OF APUS	NAPU
NO OF AUTOPILOT CHANNELS	NCHAN
NO OF INFLIGHTOPERATED GENS	NGEN
MANUFACTURERS PROFIT RATE	PRORAT
DEPRECIATION PERIOD	DEPPER
FARE	FARE
FUEL PRICE	FUELPR
TAX RATE FOR ROI CALCUL.	TAXRAT
NO OF PODDED ENGINES	NPOD
DIRECT LABOR BURDEN FACTOR	DLBUR
NO OF YEARS FOR LCC CALCUL.	LIFE
RESIDUAL AT END OF DEPPER	RESID
RETURN ON INVESTMENT	ROI
LOAD FACTOR	LF
% OF SEATS FOR 1ST CLASS	PCTFC
MULTIPLEX INDICATOR	IMUX
AUXILIARY POWER INDICATOR	ISPOOL

C.18 FLOPS Module: carries out mission performance and cost estimation

The input to FLOPS is generated by FLOPSGEN. The output from FLOPS is post-processed by FLOPSPOST. The input generator retrieves data from the neutral file while the post-processor updates it for output response parameters.

C.19 FLOPSPOST Module:

post-process the FLOPS output from the

<u>Input Parameters</u>		<u>Output Parameters</u>	
FLOPS PROBLEM TYPE	IOPT	TAXI OUT INITIAL WEIGHT	WTAXOUT
FLOPS ANALYSIS OPTION	IANAL	TAXI OUT FUEL REQUIRED	FTAXOUT
FLOPS COST ANALYSIS FLAG	ICOST	TAKE OFF INITIAL WEIGHT	WTAXOFF
STRUCTURAL ULTIMATE LOAD	ULF	TAXI OFF FUEL REQUIRED	FTAXOFF
DIHEDRAL (POSITIVE)	DIH	CLIMB INITIAL WEIGHT	WTCLIMB
AREA	SHT	CLIMB FUEL REQUIRED	FLCLIMB
1/4 CHORD SWEEP ANGLE	SWPHT	CRUISE INITIAL WEIGHT	WTCRUIS
ASPECT RATIO	ARHT	CRUISE FUEL REQUIRED	FLCRUIS
TAPER RATIO	TRHT	DESCENT INITIAL WEIGHT	WTDESCE
T/C	TCHT	DESCENT FUEL REQUIRED	FLDESCE
LOCATION ON VERTICAL TAIL	HHT	ZERO FUEL INITIAL WEIGHT	WTZEROF
NUMBER OF VERTICAL TAILS	NVERT	TOTAL DESIGN RANGE	DERNMI
AREA	SVT	TOTAL FLIGHT TIME	TOTTIME
1/4 CHORD SWEEP ANGLE	SWPVT	TOTAL NITROGEN OXIDES EMISS	TOTNITR
ASPECT RATIO	ARVT	TIME SINCE TAKEOFF	TIME1
TAPER RATIO	TRVT	CURRENT ALTITUDE	ALTIME1
T/C	TCVT	CURRENT SPEED (MACH NUMBER)	TIMACH1
NUMBER OF FUSELAGES	NFUSE	DISTANCE TRAVELED SOFAR	DIST1
TOTAL LENGTH	XL	CURRENT AIRCRAFT GROSS WGHT	GWTIME1
MAXIMUM WIDTH	WF	AMOUNT OF FUEL CONSUMED	FUELT11
MAXIMUM DEPTH	DF	CURRENT ENGINE THRUST	THRST11
CARGO AIRCRAFT FACTOR	CARGF	FLOPS SPECIFIC FUEL CONSUM.	SFCFL1
PASSENGER COMPART LENGTH	XLP	CURRENT FUEL FLOW RATE	FLOWFL1
LENGTH OF MAIN GEAR	XMLG	TIME SINCE TAKEOFF	TIME2
LENGTH OF NOSE GEAR	XNLG	CURRENT ALTITUDE	ALTIME2
CARRIER BASED AIRCRAFT	CARBAS	CURRENT SPEED (MACH NUMBER)	TIMACH2
NUMBER OF ENGINES ON WING	NEW	DISTANCE TRAVELED SOFAR	DIST2
NUMBER OF ENGINES ON FUSE	NEF	CURRENT AIRCRAFT GROSS WGHT	GWTIME2
BASLINE ENGINE THRUST	THRSO	AMOUNT OF FUEL CONSUMED	FUELT12
BASLINE ENGINE WEIGHT	WENG	CURRENT ENGINE THRUST	THRST12
WEIGHT SCALING PARAMETER	EEXP	FLOPS SPECIFIC FUEL CONSUM.	SFCFL2
BASLINE NACELLE LENGTH	XNAC	CURRENT FUEL FLOW RATE	FLOWFL2
BASLINE NACELLE DIAMETER	DNAC	TIME SINCE TAKEOFF	TIME3
FUEL CAPACITY OF WING	FULWMX	CURRENT ALTITUDE	ALTIME3
FUEL CAPACITY OF FUSELAGE	FULFMX	CURRENT SPEED (MACH NUMBER)	TIMACH3
AUX. TANK FUEL CAPACITY	FULAUX	DISTANCE TRAVELED SOFAR	DIST3
NUMBER OF FUEL TANKS	NTANK	CURRENT AIRCRAFT GROSS WGHT	GWTIME3
ADDED MISC PROP SYSTEM WT	WPMISC	AMOUNT OF FUEL CONSUMED	FUELT13
FIRST CLASS PASSENGERS	NPF	CURRENT ENGINE THRUST	THRST13
TOURIST PASSENGERS	NPT	FLOPS SPECIFIC FUEL CONSUM.	SFCFL3
STEWARDESSES	NSTU	CURRENT FUEL FLOW RATE	FLOWFL3
GALLEY CREW	NGALC	FLOPS AIRCRAFT GROSS WEIGHT	GWFLTO
FLIGHT CREW	NFLCR	FLOPS DESIGN MACH NUMBER	DESMAC
WEIGHT PER PASSENGER	WPPASS	FLOPS CRUISE VELOCITY	VFLOPS
BAGGAGE PER PASSENGER	BPP	FLOPS MAX. DYNAMIC PRESSURE	PRESSF
THRUST REVERSERS - TOTAL	WTHR	FLOPS TOTAL RANGE	RGFLTO
DESIGN RANGE	DESRNG	FLOPS BLOCK TIME	BTIMFL
WING LOADING REQUIRED	WSR	FLOPS BLOCK FUEL	BFUELF
THRUST/WEIGHT REQUIRED	TWR	FLOPS WING WEIGHT	WINWGFL
HORIZ TAIL VOLUME COEF	HTVC	FLOPS WING COST	WINCOFL
VERT TAIL VOLUME COEF	VTVC	FLOPS TAIL WEIGHT	TAIWGFL
RAMP WEIGHT	GWFLPS	FLOPS TAIL COST	TAICOFL
WING ASPECT RATIO	ARFLPS	FLOPS FUSELAGE WEIGHT	FUSWGFL
WING TAPER RATIO	TRFLPS	FLOPS FUSELAGE COST	FUSCOFL
WING 1/4 CHORD SWEEP	SWEEP	FLOPS LANDING GEAR WEIGHT	LANWGFL
WING THICKNESS-CHORD RATIO	TCA	FLOPS LANDING GEAR COST	LANCOFL

Input Parameters (Continued)

CRUISE MACH NUMBER	VCMN
MAX CRUISE ALTITUDE	CH
OBJ. FUN. WEIGHTING FACTOR	OFG
OBJ. FUN. WEIGHTING FACTOR	OFF
OBJ. FUN. WEIGHTING FACTOR	OFC
WING TECHNOLOGY	AITEK
FIXED DESIGN LIFT COEFFIC.	FCLDES
TURBULENT/LAMINAR FLOW	XLLAM
MAX. LANDING/TAKEOFF WEIGHT	WRATIO
MAX. LANDING VELOCITY	VAPPR
MAX. TAKEOFF FIELD LENGTH	FLTO
MAX. LANDING FIELD LENGTH	FLLDG
MAX. CL TAKEOFF CONFIG.	CLTOM
MAX. CL LANDING CONFIG.	CLLDM
AIR DENSITY RATIO	DRATIO
FLIGHT IDLE SWITCH	IDLE
INDICATOR OF ENGINE DECK	IGENEN
MIN IDLE FUEL FLOW FRACT	FIDMIN
MAX IDLE FUEL FLOW FRACT	FIDMAX
ENGINE DECK FILE NAME	EIFILE
PRINT MISSION CONTROL	IFLAG
DETAILED MISSION PRINT	MSUMPT
FLAG FOR RAMP WEIGHT ESTIM.	IRW
FUEL FLOW FACTOR	FACT
CDO FACTOR	FCDO
CDI FACTOR	FCDI
OWE FACTOR	OWFACT
RANGE TOLERANCE	RTOL
ATA TRAFFIC ALLOWANCE	IATA
WEIGHT INCREMENT	DWT
TAKEOFF TIME	TAKOTM
TAXI-OUT TIME	TAXOTM
TAXI-IN TIME	TAXITM
TAKEOFF POWER SETTING	ITTF
MINIMUM CLIMB MACH NUMBER	CLMMIN
MINIMUM CLIMB ALTITUDE	CLAMIN
NUMBER OF CLIMB STEPS	NINCL
CLIMB OPTIMIZATION FACTOR	FWF
CRUISE OPTION SWITCH	IOC
MINIMUM MACH NUMBER	CRMMIN
MINIMUM DESCENT ALTITUDE	DEAMIN
MISSED APPROACH TIME	TIMMAP
RESERVE HOLDING TIME	HOLDTM
2ND RES HOLD TIME OR FRAC	THOLD
NUMBER OF DESCENT STEPS	NINDE
MINIMUM DESCENT MACH NO.	DEMMIN
WEIGHT COMPUTATION OPTION	MYWTS
DESIGN RANGE	DESRNG2
REQUIRED WING LOADING	WSR2
REQUIRED THRUST/WEIGHT	TWR2
TYPE OF COST CALCULATION	ICOSTP
R&D SWITCH	IRAD
YEAR FOR CALCULATIONS	DYEAR
DEVELOPMENT START TIME	DEVST
FAA CERTIFICATION DATE	PLMQT
SPARES FACTOR FOR AIRFRAME	FAFMSP
SPARES FACTOR FOR ENGINES	FENGSP
AIRFRAME PRODUCTION QUANT.	Q
NO OF PROTOTYPE AIRCRAFT	NPROTP

Output Parameters (Continued)

FLOPS NACELLE WEIGHT	NACWGFL
FLOPS NACELLE COST	NACCOFL
FLOPS THRUST REVERSER WGT	THRWGFL
FLOPS THRUST REVERSER COST	THRCOFL
FLOPS SURFACE CONTROL WGT	SURWGFL
FLOPS SURFACE CONTROL COST	SURCOFL
FLOPS AUX POWER UNIT WEIGHT	AUXWGFL
FLOPS AUX POWER UNIT COST	AUXCOFL
FLOPS INSTRUMENTS WEIGHT	INSWGFL
FLOPS INSTRUMENTS COST	INSCOFL
FLOPS HYDRAULICS WEIGHT	HYDWGFL
FLOPS HYDRAULICS COST	HYDCOFL
FLOPS ELECTRICAL WEIGHT	ELEWGFL
FLOPS ELECTRICAL COST	ELECOFL
FLOPS AVIONICS WEIGHT	AVIWGFL
FLOPS AVIONICS COST	AVICOFL
FLOPS FURNISHING WEIGHT	FURWGFL
FLOPS FURNISHING COST	FURCOFL
FLOPS AIR CONDITION. WEIGHT	AIRWGFL
FLOPS AIR CONDITION. COST	AIRCOFL
FLOPS ANTI-ICING WEIGHT	ICEWGFL
FLOPS ANTI-ICING COST	ICECOFL
FLOPS PNEUMATIC WEIGHT	PNEWGFL
FLOPS PNEUMATIC COST	PNECOFL
FLOPS EMPTY WEIGHT	EMPWGFL
FLOPS TOTAL AIRFRAME COST	AIRTCOS
FLOPS AIRFRAME R&D COST	RADCOST
AIRFRAME INSPECT.MATERIAL	AIRMAT
AIRFRAME INSPECT.LABOR	AIRLAB
AIR CONDITIONING MATERIAL	ACMAT
AIR CONDITIONING LABOR	ACLAB
AUTOPILOT MATERIAL COST	AUTMAT
AUTOPILOT LABOR COST	AUTLAB
COMMUNICATIONS MATERIAL	COMMAT
COMMUNICATIONS LABOR COST	COMLAB
ELECTRICAL POWER MATERIAL	ELEMAT
ELECTRICAL POWER LABOR COST	ELELAB
EQUIPMENT & FURNISHINGS MAT	EQUMAT
EQUIPMENT & FURNISHINGS LAB	EQULAB
FIRE PROTECTION MATERIAL	FIRMAT
FIRE PROTECTION LABOR	FIRLAB
FLIGHT CONTROLS MATERIAL	FLIMAT
FLIGHT CONTROLS LABOR	FLILAB
FUEL MATERIAL	FUEMAT
FUEL LABOR	FUELAB
HYDRAULIC POWER MATERIAL	HYDMAT
HYDRAULIC POWER LABOR	HYDLAB
ICE AND RAIN PROTECTION MAT	ICEMAT
ICE AND RAIN PROTECTION LAB	ICELAB
INSTRUMENTS MATERIAL	INSMAT
INSTRUMENTS LABOR	INSLAB
LANDING GEAR MATERIAL	LANMAT
LANDING GEAR LABOR	LANLAB
LIGHTING MATERIAL	LIGMAT
LIGHTING LABOR	LIGLAB
NAVIGATION MATERIAL	NAVMAT
NAVIGATION LABOR	NAVLAB
OXYGEN MATERIAL	OXYMAT
OXYGEN LABOR	OXYLAB

Input Parameters (Continued)

NO OF FLIGHT TEST AIRCRAFT	NFLTST
SPARES FACTOR FOR DEVELOP.	FPPFT
ENGINE PRESSURE RATIO	EPR
FLOPS ENGINE DESIGN SFC	FLSFC
MAX TURBINE INLET TEMP	TEMPTUR
BODY TYPE SWITCH	IBODY
CIRCUIT INDICATOR	ICIRC
AC TOTAL PACK FLOW	AC
APU FLOW RATE	APUFLW
APU SHAFT HORSEPOWER	APUSHP
HYDRAULIC PUMP FLOW RATE	HYDGPM
KVA RATING OF FULLTIME GENS	KVA
NO OF APUS	NAPU
NO OF AUTOPILOT CHANNELS	NCHAN
NO OF INFLIGHTOPERATED GENS	NGEN
MANUFACTURERS PROFIT RATE	PRORAT
DEPRECIATION PERIOD	DEPPER
FARE	FARE
FUEL PRICE	FUELPR
TAX RATE FOR ROI CALCUL.	TAXRAT
NO OF PODDED ENGINES	NPOD
DIRECT LABOR BURDEN FACTOR	DLBUR
NO OF YEARS FOR LCC CALCUL.	LIFE
RESIDUAL AT END OF DEPPER	RESID
RETURN ON INVESTMENT	ROI
LOAD FACTOR	LF
% OF SEATS FOR 1ST CLASS	PCTFC
MULTIPLEX INDICATOR	IMUX
AUXILIARY POWER INDICATOR	ISPOOL
AIRCRAFT GROSS WEIGHT	GW
WEIGHT of BARE ENGINE	EN
ESTIMATED TOTAL LENGTH	TLEN
ESTIMATED MAXIMUM RADIUS	RADMAX
NUMBER OF ENGINES	NE
CRUISE ALTITUDE	ALT
CRUISE SPEED	VC
CRUISE THRUST	ATC
RANGE	RANGE

Output Parameters (Continued)

PNEUMATICS MATERIAL	PNEMAT
PNEUMATICS GEAR LABOR	PNELAB
WATER/WASTE MATERIAL COST	WATMAT
WATER/WASTE LABOR COST	WATLAB
AIRBORNE AUXIL. POWER MAT.	AUXMAT
AIRBORNE AUXIL. POWER LABOR	AUXLAB
STRUCTURES MATERIAL COST	STRMAT
STRUCTURES LABOR COST	STRLAB
DOORS MATERIAL COST	DORMAT
DOORS LABOR COST	DORLAB
FUSELAGE MATERIAL COST	FUSMAT
FUSELAGE LABOR COST	FUSLAB
NACELLES MATERIAL COST	NACMAT
NACELLES LABOR COST	NACLAB
STABILIZERS MATERIAL COST	STAMAT
STABILIZERS LABOR COST	STALAB
WINDOWS MATERIAL COST	WINMAT
WINDOWS LABOR COST	WINLAB
WINGS MATERIAL COST	WIGMAT
WINGS LABOR COST	WIGLAB
AIRFRAME MAINTENANCE MAT.	AFRMAT
AIRFRAME MAINTENANCE LABOR	AFRLAB
PROPULSION SYSTEM MAINT.MAT	PROMAT
PROPULSION SYSTEM MAINT.LAB	PROLAB
MATERIAL COST SUBTOTAL	SUBMAT
DIRECT LABOR SUBTOTAL	SUBLAB
MAINTENANCE LABOR BURDEN	BURLAB
TOTAL MAINTENANCE/DEPARTURE	MAICOS
DEPRECIATION COST	DEPCOS
INSURANCE COST	RCECOS
AIRCRAFT SERVICING COST	SERCOS
FLIGHT CREW COST	CRECOS
FUEL COST	FUECOS
LIFETIME DOC COST	LIFCOS
GROUND PROPERTY/EQUIP. COST	GROCOS
CABIN CREW EXPENSES COST	CABCOS
PASSENGER FOOD & BEVERAGE	FABCOS
PASS. SERVICE SUPPORT COST	SUPCOS
AIRCRAFT CONTROL COST	CONCOS
PASSENGER HANDLING, RESERV.	HANCOS
BAGGAGE HANDLING COST	BAGCOS
CARGO HANDLING COST	CARCOS
FREIGHT SALES COST	SALCOS
GENERAL/ADMINISTRATIVE COST	ADMCOS
TOTAL INDIRECT OPERATING	INDCOS
FLOPS MANUFACTURING COST	MANCOS
AIRFRAME SPARES COST	SPACOS
ENGINES SPARES COST	SPECOS
MANUFACTURERS PROFIT	MANPRO
TOTAL ACQUISITION COST	ACQCOS
TOTAL LIFE DOC	DOCLIF
TOTAL LIFE INDIRECT OC	IOCLIF
TOTAL LIFE CYCLE COST	CYCCOS
TOTAL LIFE OPERATING COST	OPECOS
RETURN ON INVESTMENT	ROIPEP
FARE COST	FARCOS

The time-dependent mission output parameters obtained from the FLOPS module are:

- segment 1 climb detailed data: TIME1, ALTIME1, TIMACH1, DIST1, GWTIME1, FUELTI1, THRSTI1, SFCFL1, and FLOWFL1
- segment 2 cruise detailed data: TIME2, ALTIME2, TIMACH2, DIST2, GWTIME2, FUELTI2, THRSTI2, SFCFL2, and FLOWFL2
- segment 3 descent detailed data: TIME3, ALTIME3, TIMACH3, DIST3, GWTIME3, FUELTI3, THRSTI3, SFCFL3, and FLOWFL3

APPENDIX D

T/BEST EXECUTIVE SYSTEM MISCELLANEOUS DATA

D.1 Listing of the T/BEST UNIX Shell *tbest.exe*

The T/BEST shell script, *tbest.exe*, used to manage and control the execution of T/BEST analyses modules is listed here:

```
base=`pwd`;
cd $base;
bold=`tput smso`;
unbold=`tput rmso`;
suf='input';
clear;
echo;
echo;
echo;
echo " TTTTTTTTTTTT // BBBB BBBB EEEEEEEEEEE SSSSSSSSSS TTTTTTTTTTTT";
echo " TTTTTTTTTTTT // BBBB BBBB EEEEEEEEEEE SSSSSSSSSS TTTTTTTTTTTT";
echo " TT // BB BB EE SS SS TT";
echo " TT // BB BB EE SS TT";
echo " TT // BB BB EE SSS TT";
echo " TT // BBBB EEEEEEEEE SSSSSSSS TT";
echo " TT // BBBB EEEEEEEEE SSSSSSSS TT";
echo " TT // BB BB EE SSS TT";
echo " TT // BB BB EE SS TT";
echo " TT // BB BB EE SS TT";
echo " TT // BBBB EEEEEEEEE SSSSSSSSSS TT";
echo " TT // BBBB EEEEEEEEE SSSSSSSSSS TT";
echo;
echo;
echo " ${bold}T${unbold}echnology ${bold}B${unbold}enefit
${bold}EST${unbold}imator";
echo;
echo " $LOGNAME\c";
tput cup 19 70;
date +%D";
name=`grep $LOGNAME /etc/passwd | cut -d: -f5`;
echo " $name\c";
tput cup 20 70;
date +%T";
echo;
echo " Press <return> to continue . . . or press h for help . . . ";
read junk;
#
# if user responds with an 'h', present the help menus.
#
if [ $junk -a $junk = 'h' ] ; then
    cd ${base}/help
    help tbest
    cd ${base}
fi;
# go to graphics directory and check the need to compile and link the
# graphic code
cd ${base}/exe/graphexe
check1='pchart.exe'
check2='bchart.exe'
clear;
if [ -x $check1 ] ; then :
else
    cd ${base}/src/graphsrc
    tput cup 11 10;
    echo " Compiling/Linking ${bold}piechart${unbold} graphic module";
    f77 -c pchart.f
    cc -c piechart.c
    f77 -o pchart.exe pchart.o piechart.o -lgl_s >/dev/null
    mv pchart.exe ${base}/exe/graphexe/pchart.exe
    /bin/rm pchart.o piechart.o
    cd ${base}/exe/graphexe
fi;
if [ -x $check2 ] ; then :
else
```



```

    cd ${base}/src/graphsrc
    tput cup 14 10;
    echo " Compiling and Linking ${bold}bchart${unbold} graphic module";
    f77 -c bchart.f
    cc -c bchart.c
    f77 -o bchart.exe bchart.o bchart.o -lg1_s > /dev/null
    mv bchart.exe ${base}/exe/graphexe/bchart.exe
    /bin/rm bchart.o bchart.o
fi;
#
# check if flops.exe is present if not then compile and link
# the modules that make-up the flops executable
#
clear;
cd ${base}/exe/flops
check3='flops.exe'
if [ -x $check3 ] ; then :
else
    cd ${base}/src/flops
# shell script to compile and link the flops module
    tput cup 11 10;
    echo " Compiling/Linking ${bold}flops${unbold} modules";
    f77 -c -static sfaero.f
    f77 -c -static sfcost.f
    f77 -c -static sfcycl.f
    f77 -c -static sfeng.f
    f77 -c -static sffoot.f
    f77 -c -static sfmain.f
    f77 -c -static sferf.f
    f77 -c -static sftol.f
    f77 -c -static sfwate.f
    f77 -c -static smacyc.f
    f77 -c -static smatol.f
    f77 -o flops.exe sfaero.o sfcost.o sfcycl.o sfeng.o sffoot.o sfmain.o sferf.o sftol.o
    sfwate.o smacyc.o smatol.o
    /bin/rm s*.o
    mv flops.exe ${base}/exe/flops/flops.exe
fi;
cd ${base}
#
# read a list of all executables and check to see if they exist in their
# appropriate locations, if not check for the source under the src directory
# and compile it with the -static option, output going to the appropriate
# output directory.
#
exec < ${base}/list.exefiles;
while read exes; do
clear;
    if [ ! -x ${base}/${exes} ] ; then
        sources='basename $exes .exe';
        if [ -r ${base}/src/$sources.f ] ; then
            tput cup 11 10;
            echo " Compiling/Linking ${bold}$sources${unbold} module";
            f77 -static -o ${base}/${exes} ${base}/src/$sources.f;
        else
            echo " \07\07Unable to locate source file for $sources";
            exit;
        fi;
    fi;
done;
clear;
exec < /dev/tty;
cd ${base}/out;
/bin/rm -f M*.OUT B*.OUT nnepwate.out fort.*;
cd ${base}/in;
#
    /bin/rm -f FCR RANGE blade.order neutral.updated scratch* fort.*;
    /bin/rm -f B*.INP B*.OUT M*.INP M*.OUT;
    /bin/rm -f ${base}/wrk/*.scratch;
# execute here the code neutgen to generate the neutral.file
#
#
# Show that neutgen is being executed and wait for user to respond to continue.
#
cp ${base}/airfoil.bank airfoil.bank;
cp ${base}/databk.data .;
clear;
tput cup 9 27;
echo " Executing ${bold}neutgen${unbold}";
tput cup 11 10;

```

```

echo " Generating neutral file for T/BEST";
tput cup 13 10;
echo " INPUT: neutral.file ${bold}default${unbold} parameters";
tput cup 15 10;
echo " OUTPUT:${bold}$base/in/neutral.file${unbold}";
tput cup 18 10;
echo " Press <return> to continue . . . \c";
read junk;
clear;
${base}/exe/misc/neutgen.exe;
clear;
#
# Decide the name of the input file.
#
infile=`/bin/ls -Ct *.input 2> /dev/null`;
inum=`echo $infile | awk ' { print NF } '`;
infile=`expr \echo $infile | awk ' (print $1) '\` : "\(.*\)\.$suf`";
#
# if there is more than one input file, give the user the option to choose
# which one he/she wishes to use.
#
if [ $inum -gt 1 ] ; then
clear;
tput cup 11 20;
echo "T/BEST has chosen ${bold}$infile${unbold} as its input";
tput cup 13 5;
echo "Would you like to use a different input file? (Y/N) \c";
read junk;
if [ "$junk" ] ; then :
else
junk='N';
fi;
if [ `echo $junk | tr '[a-z]' '[A-Z]'` = 'Y' ] ; then
while true; do
clear;
tput cup 11 25;
echo "Your choices are as follows:\n";
/bin/ls -CF *.input;
echo "\nWhich file do you wish to choose? \c";
read junk;
if [ "$junk" ] ; then
pre=`expr $junk : '\(.*\)\.$suf`';
post=`expr $junk : '.*\(.*\)'`;
if [ $post ] ; then
if [ "$post" != "input" ] ; then
echo "The input file must have an extension of \c";
echo "${bold}input${unbold}";
echo "\nPress <return> to continue . . . \c";
read junk;
continue;
else
thefile=$pre.$post;
if [ -f $thefile ] ; then
infile=`expr \echo $thefile\` : '\(.*\).input`';
break;
else
echo "$thefile: does not exist";
echo "\nPress <return> to continue . . . \c";
read junk;
continue;
fi;
fi;
elif [ -f $junk.input ] ; then
infile=$junk;
break;
else
echo "$junk.input: does not exist";
echo "\nPress <return> to continue . . . \c";
read junk;
continue;
fi;
fi;
done;
fi;
fi;
#
# Enter into an infinite loop such that if the appropriate conditions exist,
# the code will re-run nnepwate.
#
while true; do

```

```

#
# if the matching maps file does not exist for the given input file, exit.
#
if [ -f $infile.maps ] ; then :
else
    echo "File: $infile.maps does not exist";
    exit;
fi;

# Generate the input responses to nnepwate.
#
cd $(base)/wrk;
echo $infile > nnepwate.in;
echo " " >> nnepwate.in;
echo "$base/out/$infile.output" >> nnepwate.in;

# Present the screen which informs the user that NNEP/WATE is being executed.
#
cp $(base)/in/$infile.input .;
cp $(base)/in/$infile.maps .;
clear;
tput cup 9 27;
echo "Executing ${bold}nnepwate${unbold}";
tput cup 11 10;
echo "Engine cycle and weight analyses"
tput cup 13 10;
echo "INPUT: ${bold}$base/in/$infile.input${unbold}";
tput cup 15 10;
echo "OUTPUT: ${bold}$base/out/$infile.output${unbold}";
tput cup 24 1;
$(base)/exe/nnepwate/nnepwate.exe< nnepwate.in >>$(base)/wrk/nnep.scratch 2>&1;
cd $(base)/in;
cp $(base)/out/$infile.output ./nnepwate.out;

# Show that nnepost is being executed and wait for user to respond to continue.
#
clear;
tput cup 9 27;
echo "Executing ${bold}nnepost${unbold}";
tput cup 11 10;
echo "Post-Processing nnepwate output";
tput cup 13 10;
echo "INPUT: ${bold}$base/out/$infile.output${unbold}";
tput cup 15 10;
echo "OUTPUT: ${bold}$base/in/neutral.file${unbold}";
/bin/rm -f neutral.updated scratch* fort.*;
$(base)/exe/misc/nnepost.exe;
tput cup 18 10;
echo "Press <return> to continue . . . \c";
read junk;
clear;

# Generate blasim input files
#
tput cup 9 27;
echo "Executing ${bold}blasimgen${unbold}";
tput cup 11 10;
echo "Generating blasim input files for all stages";
tput cup 12 10;
echo "of each fan, compressor, and turbine";
tput cup 14 10;
echo "INPUT: ${bold}neutral.file${unbold}";
tput cup 16 10;
echo "OUTPUT: ${bold}blasim${unbold} input files";
$(base)/exe/misc/blasimgen.exe;
/bin/rm -f neutral.updated;
tput cup 19 10;
echo "Press <return> to continue . . . \c";
read junk;
clear;

# Generate the names of the input files for blasim, generate a listing
# of these files in numerical order in the file blade.order.
#
inputs=`echo B*.INP`;
/bin/ls B*.INP | sort +0.4 > blade.order;

# Define a looping mechanism which runs each generated input file in
# blasim and moves the output to the tbest directory.
#

```

```

cp ${base}/databk.data fort.8;
for i in $inputs; do
    pre='expr "$i" : '\(.*\).INP'';
    cp $pre.INP fort.25;
    clear;
    tput cup 9 21;
    echo "BLASIM is processing ${bold}$pre.INP${unbold} ";
    title='awk ' NR == 1 { print $0 } ' $pre.INP';
    col='awk ' NR == 1 { printf("%d",length($0)) } ' $pre.INP';
#   col='expr \`expr 80 - $col\` / 2`;
#   tput cup 11 $col;
#   tput cup 11 1;
#   echo $title;
    tput cup 11 10;
    echo "Blade structural analysis";
    tput cup 13 10;
    echo "INPUT: ${bold}${base}/in/$pre.INP${unbold}";
    tput cup 15 10;
    echo "OUTPUT: ${bold}${base}/out/$pre.OUT${unbold}";
    tput cup 24 1;
    ${base}/exe/blasim/blasim.exe > blasim.out;
    ${base}/exe/misc/blasimsr.exe ;
    cat root.static >> tempo
    cp fort.30 $pre.OUT;
    mv fort.30 ${base}/out/$pre.OUT;
    /bin/rm -f fort.* blasim.out junk*;
    done;
    mv tempo root.static;
#
# execute blasimpost.exe executable.
#
    clear;
    tput cup 9 27;
    echo " Executing ${bold}blasimpost${unbold}";
    tput cup 11 10;
    echo " Update neutral file to include structural response parameters";
    tput cup 13 10;
    echo " INPUT: ${bold}blasim${unbold} output files";
    tput cup 15 10;
    echo " OUTPUT: ${bold}neutral.file${unbold}";
    ${base}/exe/misc/blasimpost.exe;
    tput cup 18 10;
    echo " Press <return> to continue . . . \c";
    mv root.static ${base}/out/root.static;
    read junk;
    /bin/rm -f neutral.updated B*.OUT fort.*;
####
# Run the mtsbgen.exe executable.
#
    clear;
    tput cup 9 27;
    echo " Executing ${bold}mtsbggen${unbold}";
    tput cup 11 10;
    echo " Generating mtsb input files for all stages";
    tput cup 12 10;
    echo " of each fan, compressor, and turbine";
    tput cup 14 10;
    echo " INPUT: ${bold}neutral.file${unbold}";
    tput cup 16 10;
    echo " OUTPUT: ${bold}mtsbs${unbold} input files";
    ${base}/exe/misc/mtsbggen.exe;
    /bin/rm -f neutral.updated;
    tput cup 19 10;
    echo " Press <return> to continue . . . \c";
    read junk;
    clear;
#
# Define a looping mechanism which runs each generated input file in
# mtsb and moves the output to the out directory.
#
    inputs='echo M*.INP';
    for i in $inputs; do
        pre='expr "$i" : '\(.*\).INP'';
        cp $pre.INP fort.33;
        clear;
        tput cup 9 21;
        echo "MTSB is processing ${bold}$pre.INP${unbold} ";
        tput cup 11 10;
        echo "Transonic flow analysis";
        tput cup 13 10;

```

```

        echo "INPUT: ${bold}${base}/in/$pre.INP${unbold}";
        tput cup 15 10;
        echo "OUTPUT: ${bold}${base}/out/$pre.OUT${unbold}";
        tput cup 24 1;
        ${base}/exe/mtsb/mtsb.exe > out;
        cp fort.26 $pre.OUT;
        mv fort.26 ${base}/out/$pre.OUT;
        /bin/rm -f fort.* out;
        done;

#
# Run the mtsbpost.exe executable.
#
        clear;
        tput cup 9 27;
        echo " Executing ${bold}mtsbpost${unbold}";
        tput cup 11 10;
        echo " Update neutral file to include output parameters form mtsb";
        tput cup 13 10;
        echo " INPUT:  ${bold}mtsb${unbold} output files";
        tput cup 15 10;
        echo " OUTPUT:  ${bold}neutral.file${unbold}";
        ${base}/exe/misc/mtsbpost.exe;
        /bin/rm -f neutral.updated M*.OUT;
        tput cup 18 10;
        echo " Press <return> to continue . . . \c";
        read junk;
        clear;
        /bin/rm -f neutral.updated;

#
# Run noise.exe executable.
#
        tput cup 9 27;
        echo " Executing ${bold}noise${unbold}";
        tput cup 11 10;
        echo " Estimates fan tone, broad band and noise jet";
        tput cup 12 10;
        echo " Update neutral file";
        tput cup 14 10;
        echo " INPUT:  ${bold}neutral.file${unbold}";
        tput cup 16 10;
        echo " OUTPUT:  ${bold} updated neutral.file${unbold}";
        ${base}/exe/misc/noise.exe>>${base}/wrk/noise.scratch;
        cat fort.61 >> noise.scratch;
        mv noise.scratch ${base}/wrk/noise.scratch2;
        tput cup 19 10;
        echo " Press <return> to continue . . . \c";
        read junk;
        /bin/rm -f neutral.updated;

#
# if the file GW exists, run predtbest
#
        if [ -f GW ] ; then
        clear;
        tput cup 9 27;
        echo " Executing ${bold}predict${unbold}";
        tput cup 11 10;
        echo " Predicts gross, airframe, engine, capacity and fuel weights"
        tput cup 12 10;
        echo " Update neutral file ";
        tput cup 14 10;
        echo " INPUT:  ${bold}neutral.file${unbold}";
        tput cup 16 10;
        echo " OUTPUT:  ${bold} updated neutral.file${unbold}";
        ${base}/exe/misc/predict.exe>>${base}/wrk/predict.scratch;
        tput cup 19 10;
        echo " Press <return> to continue . . . \c";
        read junk;
        /bin/rm -f neutral.updated;
        fi;

#
# if the file AW exists, run predict (tbest)
#
        if [ -f AW ] ; then
        tput cup 9 27;
        echo " Executing ${bold}predict${unbold}";
        tput cup 11 10;
        echo " Predicts gross, airframe, engine, capacity and fuel weights"
        tput cup 12 10;
        echo " Update neutral file ";

```

```

tput cup 14 10;
echo " INPUT: ${bold}neutral.file${unbold}";
tput cup 16 10;
echo " OUTPUT: ${bold} updated neutral.file${unbold}";
${base}/exe/misc/predict.exe>>${base}/wrk/predict.scratch;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
clear;
/bin/rm -f neutral.updated;
fi;

#
# if the file EN exists, loop back to the beginning again
#
if [ -f EN ] ; then
/bin/rm -f neutral.updated;
continue;
fi;

#
# if the file FW and FCR exists, run predict (predtbest)
#
if [ -f FW -a -f FCR ] ; then
clear;
tput cup 9 27;
echo " Executing ${bold}predict${unbold}";
tput cup 11 10;
echo " Predicts gross, airframe, engine, capacity and fuel weights"
tput cup 12 10;
echo " Update neutral file ";
tput cup 14 10;
echo " INPUT: ${bold}neutral.file${unbold}";
tput cup 16 10;
echo " OUTPUT: ${bold} updated neutral.file${unbold}";
${base}/exe/misc/predict.exe>>${base}/wrk/predict.scratch;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
/bin/rm -f neutral.updated;
fi;

#
# if the file RANGE exists, run rantbest
#
if [ -f RANGE ] ; then
clear;
tput cup 9 27;
echo " Executing ${bold}range${unbold}";
tput cup 11 10;
echo " Estimates the BREGUET cruise-climb range"
tput cup 12 10;
echo " Update neutral file ";
tput cup 14 10;
echo " INPUT: ${bold}neutral.file${unbold}";
tput cup 16 10;
echo " OUTPUT: ${bold} updated neutral.file${unbold}";
${base}/exe/misc/range.exe>>${base}/wrk/range.scratch;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
/bin/rm -f neutral.updated;
fi;

#
# Run citytbest
#
clear;
tput cup 9 27;
echo " Executing ${bold}city${unbold}";
tput cup 11 10;
echo " Determines number of city pairs in U.S. and Western Europe"
tput cup 12 10;
echo " Update neutral file ";
tput cup 14 10;
echo " INPUT: ${bold}neutral.file${unbold}";
tput cup 16 10;
echo " OUTPUT: ${bold} updated neutral.file${unbold}";
${base}/exe/misc/city.exe>>${base}/wrk/city.scratch;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
/bin/rm -f neutral.updated;

```

```

# Run repair (formerly engtbest)
#
clear;
tput cup 9 27;
echo " Executing repair";
tput cup 11 10;
echo " Estimates mean time between engine repair and material/labor"
tput cup 12 10;
echo " Update neutral file ";
tput cup 14 10;
echo " INPUT: neutral.file";
tput cup 16 10;
echo " OUTPUT: updated neutral.file";
$(base)/exe/misc/repair.exe>>$(base)/wrk/repair.scratch;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
/bin/rm -f neutral.updated;

# Run doc
#
clear;
tput cup 9 27;
echo " Executing doc";
tput cup 11 10;
echo " Predicts direct operating cost of airframe and engines"
tput cup 12 10;
echo " Update neutral file ";
tput cup 14 10;
echo " INPUT: neutral.file";
tput cup 16 10;
echo " OUTPUT: updated neutral.file";
$(base)/exe/misc/doc.exe>>$(base)/wrk/doc.scratch;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
/bin/rm -f neutral.updated;

# Run lcc (formerly servtbest)
#
clear;
tput cup 9 27;
echo " Executing lcc";
tput cup 11 10;
echo " Predicts engine maintenance cost for a given year of service"
tput cup 12 10;
echo " Update neutral file ";
tput cup 14 10;
echo " INPUT: neutral.file";
tput cup 16 10;
echo " OUTPUT: updated neutral.file";
$(base)/exe/misc/lcc.exe>>$(base)/wrk/lcc.scratch;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
clear;
/bin/rm -f neutral.updated scratch* fort.*;

# generate flops input file
#
tput cup 9 27;
echo " Executing flopsgen";
tput cup 11 10;
echo " Generating flops input file";
tput cup 14 10;
echo " INPUT: neutral.file";
tput cup 16 10;
echo " OUTPUT: flopsin.file";
$(base)/exe/misc/flopsgen.exe;
/bin/rm -f neutral.updated;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
clear;

# Run flops (flight optimization system)
#
clear;
tput cup 6 27;

```

```

echo " Executing ${bold}flops${unbold}";
tput cup 8 10;
echo " Flight Optimization System (mission/cost analyses)"
tput cup 10 10;
echo " INPUT:  ${bold}flopsin.file${unbold}";
tput cup 11 10;
echo "          file renamed $infile.flopsin";
tput cup 13 10;
echo " OUTPUT:  ${bold}flopsout.file${unbold}";
tput cup 14 10;
echo "          file renamed $infile.flopsout";
tput cup 16 10;
echo " ";
$(base)/exe/flops/flops.exe <flopsin.file> flopsout.file;
tput cup 18 10;
echo " Press <return> to continue . . . \c";
read junk;
clear;
/bin/rm -f neutral.updated scratch* fort.*;

#
# post-processing flops output file
#
tput cup 9 27;
echo " Executing ${bold}flopspost${unbold}";
tput cup 11 10;
echo " Updating neutral file to include flops response parameters";
tput cup 14 10;
echo " INPUT:  ${bold}flopsout.file${unbold}";
tput cup 16 10;
echo " OUTPUT:  ${bold}neutral.file${unbold}";
$(base)/exe/misc/flopspost.exe;
/bin/rm -f neutral.updated;
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
clear;

#
# clean up
#
clear;
tput cup 14 10;
echo "T/BEST neutral.file renamed ${bold}$infile.neutral${unbold}";
tput cup 16 10;
echo "User's neutral file is located in ";
tput cup 17 10;
echo "$base/in sub-directory";
tput cup 19 10;
echo " Press <return> to continue . . . \c";
read junk;
clear;
cd $(base)/in;
mv flopsin.file $infile.flopsin;
mv flopsout.file $(base)/out/$infile.flopsout;
cp neutral.file $infile.neutral;
/bin/rm -f B*.OUT M*.OUT scratch*;
/bin/rm -f mapplot.input trban.input cspan.input;
/bin/rm -f airfoil.bank databk.data neutral.updated scratch* fort.*;
/bin/rm -f small.btherm *.amac *.errors nnepwate.out;

cd $(base)/exe/blasim;
/bin/rm -f fort.*;
cd $(base)/in;

#
# graphics processed next
#
tput cup 9 10;
echo " Execution of graphic codes to display results ";
tput cup 12 10;
echo " Press <return> to continue . . . \c";
read junk;
clear;
$(base)/exe/graphexe/pchart.exe
$(base)/exe/graphexe/bchart.exe
/bin/rm -f fort.*;
exit;

```


D.2 Listing of *listexefile*

This file resides in */user/tbest* mother directory. It contains a list identifying executables for all modules. When T/BEST is executed on a workstation, the shell script checks for the existence of these executables. Each T/BEST module will be compiled and linked automatically if its correspondent executable is not present. The file *list.exefile* is listed here:

```
exe/blasim/blasim.exe
exe/misc/blasimpost.exe
exe/misc/report.exe
exe/misc/city.exe
exe/misc/doc.exe
exe/misc/repair.exe
exe/misc/noise.exe
exe/misc/predict.exe
exe/misc/range.exe
exe/misc/nneppost.exe
exe/misc/lcc.exe
exe/misc/blasimsr.exe
exe/misc/neutgen.exe
exe/misc/blasimgen.exe
exe/misc/mtsbgen.exe
exe/misc/mtsbpost.exe
exe/mtsb/mtsb.exe
exe/nnepwate/nnepwate.exe
```

D.3 Database for PREDICT Module

A complete listing of the PREDICT database is listed here. Each block in the database consists of four lines which provides data pertaining to aircraft type and model, engine weight and architecture, speed, landing requirements, etc.

FIRST DATA LINE:

aircraft, aircraft name, number of crew, number of passengers, cargo weight (lb.), wing span (ft.), wing area (sq. ft.), aircraft length (ft.), aircraft height (ft.),

SECOND DATA LINE:

empty weight (lb.), gross weight (lb.), landing weight (lb.), number of engines, engine name, maximum speed (mph), cruise speed (mph or Mach), landing speed (mph), take-off field length (ft.)

THIRD DATA LINE:

landing field length (ft.), range, engine name, number of compressor stages (spool 1), number of compressor stages (spool 2), number of compressor stages (spool 3), number of turbine stages (spool 1), number of turbine stages (spool 2), number of turbine stages (spool 3),

FOURTH DATA LINE:

thrust; specific fuel consumption; overall pressure ratio; engine diameter; engine length; engine weight

```
-----
727-100      name                3  94      900      108.0  1560  133.2  34.0
87600      170000  142500  3  P&WJT8D-9      600    .84      136  7950
4300      2530  PWJT8D-9  13  0  0  4  0  0
14500 .60 15.9 42.5 124 3377

727-200      Advanced                3  145      1525  108.0  1560  153.2  34.0
98300      191500  154500  3  P&WJT8D-15A      600    .84      147  10000
5300      2240  PWJT8D-15A 13  0  0  4  0  0
15500 .59 16.5 42.5 124 3474

737-100      name                2  103      650    93.0   980   94.0   37.0
62000      111000  101000  2  P&WJT8D-9      586    .78      144  4300
4000      1300  PWJT8D-9  13  0  0  4  0  0
14500 .60 15.9 42.5 124 3377

737-200      Advanced                2  120      875    93.0   980   100.2  37.0
60660      116000  103000  2  P&WJT8D-15A      586    .78      148  6860
4260      2140  PWJT8D-15A 13  0  0  4  0  0
15500 .59 16.5 42.5 124 3474

737-200      Advanced                2  120      640    93.0   980   100.2  37.0
62445      128600  107000  2  P&WJT8D-17A      586    .78      152  8970
4580      2840  PWJT8D-17A 13  0  0  4  0  0
16000 .6 16.9 42.5 124 3475

737-300      name                2  141      1068  94.8   980   109.6  36.5
69730      125000  114000  2  CFM56-3-B1      566    .745      153  6650
4580      1840  CFM56-3-B1 1  3  9  1  4  0
20000 .38 22.6 63 93 4276
```

737-300	name	2	141	1068	94.8	980	109.6	36.5
69730	135500 114000	2	CFM56-3-B1	566	.745		153	9040
4580	2650 CFM56-3-B1	1	3 9 1 4 0					
20000	.38 22.6 63 93		4276					

737-300	name	2	141	853	94.8	980	109.6	36.5
70780	139000 114000	2	CFM56-3-B2	566	.745		153	7525
4580	2950 CFM56-3-B2	1	3 9 1 4 0					
22000	.39 24.3 63 93		4301					

737-400	name	2	159	1375	94.8	980	119.6	36.5
73170	139000 121000	2	CFM56-3-B2	566	.745		158	6600
4910	2250 CFM56-3-B2	1	3 9 1 4 0					
22000	.39 24.3 63 93		4301					

737-400	name	2	159	1160	94.8	980	119.6	36.5
74170	150500 124000	2	CFM56-3C	566	.745		160	7700
5300	2800 CFM56-3C	1	3 9 1 4 0					
23500	.39 1 63 93		4276					

737-500	name	2	132	822	94.9	980	101.9	36.6
68180	115500 110000	2	CFM56-3-B1	566	.745		160	7700
5300	2500 CFM56-3-B1	1	3 9 1 4 0					
20000	.38 22.6 63 93		4276					

737-500	name	2	132	822	94.9	980	101.9	36.6
68180	115500 110000	2	CFM56-3C-1	566	.745		160	7700
5300	2500 CFM56-3C-1	1	3 9 1 4 0					
23500	.39 1 63 93		4276					

747-100B	Superjet	3	452	6190	195.7	5500	231.9	63.2
373300	750000 564000	4	GECF6-45A2	640	.84		162	8750
6150	5030 GECF6-45A2	4	14 0 2 4 0					
46500	.354 26.3 105.3 183		8768					

747SR	Superjet	3	550	6190	195.7	5500	231.9	63.2
356400	600000 525000	4	GECF6-45A2	640	.84		156	5900
5800	2300 GECF6-45A2	4	14 0 2 4 0					
46500	.354 26.3 105.3 183		8768					

747-200B	Superjet	3	452	6190	195.7	5500	231.9	63.5
374100	833000 564000	4	P&WJT9D-7R4G2	640	.84		162	10900
6150	7570 PWJT9D-7R4G2	16	0 0 6 0 0					
54750	.360 26.3 97.0 153.6		9100					

747-300B	Stretched-upper-deck	3	490	6190	195.7	5500	231.9	63.5
383000	833000 574000	4	P&WJT9D-7R4G2	640	.85		165	10900
6250	7310 PWJT9D-7R4G2	16	0 0 6 0 0					
54750	.360 26.3 97.0 153.6		9100					

747-200C	Convertible	3	452	5990	195.7	5500	231.9	63.5
386500	833000 630000	4	P&WJT9D	640	.84		175	10900
6950	7200 PWJT9D-7Q,Q3	16	0 0 6 0 0					

53000 .375 24.5 97.0 153.6 9295

747SP Superjet 3 343
333300 700000 475000 4 RRRB211524D4
5500 7670 RB211-524D4 1 7 6 1 1 3
53000 .375 30 85.8 122.3 9874

3860 195.7 5500 184.7 65.4
640 .85 165 8150

747-400 Advanced-Superjet 2 509
390200 870000 630000 4 GECF6-80C2
6950 8380 GECF6-80C2B1F 5 14 0 2 5 0
57900 .316 29.9 106 168 9499

6030 211.0 5650 231.9 63.5
630 .85 175 11450

757-200 name 2 220
125940 240000 198000 2 P&WPW2037
4970 4550 PW2037 17 0 0 7 0 0
38250 .33 31.8 84.8 146.8 7160

1790 124.8 1951 155.3 44.5
593 .8 152 7700

757-200 name 2 220
125940 240000 198000 2 RRRB211-535E
4970 4550 RB211-535E 1 6 6 1 1 3
43100 .371 27 79 117.9 7114

1790 124.8 1951 155.3 44.5
593 .8 152 7700

767-200 name 2 290
176100 315000 272000 2 GECF6-80A
4800 4566 GECF6-80A 4 14 0 2 4 0
48000 .344 27.3 98.1 157 8496

3070 156.1 3050 159.2 52
594 .8 157 6500

767-200 name 2 290
176100 315000 272000 2 P&WJT9D-7R4
4800 4566 PWJT9D-7R4E 16 0 0 6 0 0
50000 .343 24.2 97.0 153.6 8905

3070 156.1 3050 159.2 52
594 .8 157 6500

767-200ER name 2 290
179900 351000 278000 2 P&WJT9D-7R4
4850 5942 PWJT9D-7R4E 16 0 0 6 0 0
50000 .343 24.2 97.0 153.6 8905

3070 156.1 3050 159.2 52
594 .8 159 8400

767-200ER name 2 290
179900 351000 278000 2 GECF6-80A
4850 5942 GECF6-80A 4 14 0 2 4 0
48000 .344 27.3 98.1 157 8496

3070 156.1 3050 159.2 52
594 .8 159 8400

767-300 name 2 290
190200 351000 300000 2 P&WJT9D-7R4
5400 4650 PWJT9D-7R4E 16 0 0 6 0 0
50000 .343 24.2 97.0 153.6 8905

4030 156.1 3050 180.3 52
594 .8 162 8900

767-300 name 2 290
190200 351000 300000 2 GECF6-80A
5400 4650 GECF6-80A 4 14 0 2 4 0
48000 .344 27.3 98.1 157 8496

4030 156.1 3050 180.3 52
594 .8 162 8900

767-300ER name 2 290

4030 156.1 3050 180.3 52

196100 400000 320000 2 P&W4000
 5700 6650 PW4060 16 0 0 6 0 0
 60000 .330 31.5 97.2 153.6 9400

594 .8 166 9200

767-300ER name 2 290
 196100 400000 320000 2 GECF6-80C2
 5700 6650 GECF6-80C2-D1F 5 14 0 2 5 0
 61500 .322 31.8 106 168 9634

4030 156.1 3050 180.3 52
 594 .8 166 9200

L-1011-1 TriStar 3 400
 241731 430000 358000 3 RRRB211-22B
 6300 3390 RB211-22B 1 7 6 1 1 3
 42000 .371 25 84.8 119.4 9195

45750 155.3 3456 177.7 55.3
 620 0.83 163 8400

L-1011-100 TriStar 3 400
 246249 466000 368000 3 RRRB211-22B
 6450 3975 RB211-22B 1 7 6 1 1 3
 42000 .371 25 84.8 119.4 9195

45750 155.3 3456 177.7 55.3
 620 0.83 163 11240

L-1011-200 TriStar 3 400
 248585 466000 368000 3 RRRB211-524B4
 6450 4140 RB211-524B2 1 7 6 1 1 3
 50000 .371 28 84.8 119.4 9814

45750 155.3 3456 177.7 55.3
 620 0.83 163 8000

L-1011-250 TriStar 3 400
 249560 496000 368000 3 RRRB211-524B4
 6450 5405 RB211-524B2 1 7 6 1 1 3
 50000 .371 28 84.8 119.4 9814

45750 155.3 3456 177.7 55.3
 620 0.83 163 9200

L-1011-500 TriStar 3 330
 245730 504000 368000 3 RRRB211-524B4
 6800 6150 RB211-524B2 1 7 6 1 1 3
 50000 .371 28 84.8 119.4 9814

61500 164.3 3540 164.2 55.3
 620 0.83 170 9400

DC-8 Series30 3 176
 26525 315000 207000 4 P&WJT4A-9
 6450 7010 PWJT4A-9 15 0 0 3 0 0
 16800 .74 1 43.0 144.1 5100

20850 142.3 2758 150.5 43.3
 600 .73 153 9050

DC-8 Series30 3 176
 26525 315000 207000 4 P&WJT4A-11
 6450 7010 PWJT4A-11 15 0 0 3 0 0
 17500 .74 1 43.0 144.1 5100

20850 142.3 2758 150.5 43.3
 600 .73 153 9050

DC-8 Series50 3 189
 34854 325000 207000 4 P&WJT3D-3B
 5400 8720 PWJT3D-3 15 0 0 4 0 0
 18000 .51 1 53. 136.6 4170

20850 142.3 2884 150.5 43.3
 600 .73 153 10000

DC-8 Super61 3 259
 48897 328000 240000 4 P&WJT3D-3B
 6150 5460 PWJT3D-3 15 0 0 4 0 0
 18000 .51 1 53. 136.6 4170

66665 142.3 2884 187.4 43.0
 600 .78 165 10000

DC-8 Super62 3 169
 41903 350000 240000 4 P&WJT3D-7
 5800 6040 PWJT3D-7 15 0 0 4 0 0
 19000 .52 1 53.0 136.6 4260

42580 148.4 2927 157.4 43.3
 600 .79 158 10150

DC-8 Super63 3 259
 53749 355000 258000 4 P&WJT3D-7
 6600 5470 PWJT3D-7 15 0 0 4 0 0
 19000 .52 1 53.0 136.6 4260

66665 148.4 2927 187.4 42.3
 600 .78 162 10450

DC-9 Series10 2 85
 51000 90700 81700 2 P&WJT8D-1
 4470 1300 PWJT8D-1 13 0 0 4 0 0
 14000 .62 16.2 42.5 124 3389

9000 89.4 934 104.4 27.5
 576 .80 145 6500

DC-9 Series20 2 85
 56000 98000 95300 2 P&WJT8D-9
 3800 1400 PWJT8D-9 13 0 0 4 0 0
 14500 .60 15.9 42.5 124 3377

9000 93.3 1001 104.4 27.5
 576 .80 129 5080

DC-9 Series20 2 85
 56000 98000 95300 2 P&WJT8D-11
 3800 1400 PWJT8D-11 13 0 0 4 0 0
 15000 .62 16.2 42.5 124 3389

9000 93.3 1001 104.4 27.5
 576 .80 129 5080

DC-9 Series30 2 110
 59000 108000 98100 2 P&WJT8D-9
 4070 1340 PWJT8D-9 13 0 0 4 0 0
 14500 .60 15.9 42.5 124 3377

13425 93.3 1001 119.3 27.5
 586 .80 141 7410

DC-9 Series40 2 120
 62500 114000 102000 2 P&WJT8D-11
 4070 1120 PWJT8D-11 13 0 0 4 0 0
 15000 .62 16.2 42.5 124 3389

15285 93.3 1001 125.6 27.5
 586 .80 141 7410

DC-9 Series40 2 120
 62500 114000 102000 2 P&WJT8D-15
 4070 1120 PWJT8D-15 13 0 0 4 0 0
 15500 .63 16.5 42.5 124 3414

15285 93.3 1001 125.6 27.5
 586 .80 141 7410

DC-9 Series50 2 135
 65150 121000 110000 2 P&WJT8D-15
 4230 1260 PWJT8D-15 13 0 0 4 0 0
 15500 .63 16.5 42.5 124 3414

15510 93.3 1001 133.5 27.5
 586 .80 142 8300

DC-9 Series50 2 135
 65150 121000 110000 2 P&WJT8D-17
 4230 1260 PWJT8D-17 13 0 0 4 0 0
 16000 .65 16.9 42.5 124 3430

15510 93.3 1001 133.5 27.5
 586 .80 142 8300

MD-81 NAME 2 155
 78440 140000 128000 2 P&WJT8D-209
 4760 1630 PWJT8D-209 14 0 0 4 0 0
 19250 .51 17.4 56.3 154 4410

18795 107.8 1209 135.6 29.8
 576 .80 140 6407

18795	107.8	1209	135.6	29.8
576	.80	140	6407	

18795	107.8	1209	135.6	29.8
576	.80	141	7594	

15195	107.8	1209	135.6	29.8
576	.80	143	8071	

14195 107.8 1209 119.1 30.5
576 .80 135 6275

18795	107.8	1209	135.6	29.8
576	.80	141	7594	

4618	155.3	3550	180.6	58.1
593	0.82	156	7270	

4618	165.3	3647	181.6	58.1
593	0.82	168	10340	

4618 165.3 3647 180.6 58.1
593 0.82 167 10250

6850	169.5	3648	200.8	57.8
600	0.82	171	10500	

6850	169.5	3648	200.8	57.8
600	0.82	171	10500	

D.4 Listing of the T/BEST Material Data Bank

This is a complete listing of the material data bank used by BLASIM in the structural analysis of fan, compressor and turbine blades. At this time, the blade is assumed to consist of a single material (isotropic), as a result, matrix data are extracted to supply elastic modulus, density, and strengths of the blade. Once, composite material option, available in BLASIM is activated, both the fiber and matrix data will be processed to determine the composite properties.

FIBER PROPERTIES

ADHX FIBER EQUIVALENT PROPERTIES OF ADHESIVE.

\$

\$

\$

Number of fibers per end	Nf	1	number
Filament equivalent diameter	df	0.500E-03	inches
Weight density	Rhof	0.400E-01	lb/in**3
Normal moduli (11)	Ef11	0.300E+06	psi
Normal moduli (22)	Ef22	0.300E+06	psi
Poisson's ratio (12)	Nuf12	0.450E+00	non-dim
Poisson's ratio (23)	Nuf23	0.450E+00	non-dim
Shear moduli (12)	Gf12	0.103E+06	psi
Shear moduli (23)	Gf23	0.103E+06	psi
Thermal expansion coef. (11)	Alfaf11	0.570E-04	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.570E-04	in/in/F
Heat conductivity (11)	Kf11	0.125E+01	BTU-in/hr/in**2/F
Heat conductivity (22)	Kf22	0.125E+01	BTU-in/hr/in**2/F
Heat capacity	Cf	0.250E+00	BTU/lb/F
Fiber tensile strength	SfT	0.800E+04	psi
Fiber compressive strength	SfC	0.150E+05	psi

T300 GRAPHITE FIBER.

\$

\$

\$

Number of fibers per end	Nf	3000	number
Filament equivalent diameter	df	0.300E-03	inches
Weight density	Rhof	0.640E-01	lb/in**3
Normal moduli (11)	Ef11	0.320E+08	psi
Normal moduli (22)	Ef22	0.200E+07	psi
Poisson's ratio (12)	Nuf12	0.200E+00	non-dim
Poisson's ratio (23)	Nuf23	0.250E+00	non-dim
Shear moduli (12)	Gf12	0.130E+07	psi
Shear moduli (23)	Gf23	0.700E+06	psi
Thermal expansion coef. (11)	Alfaf11	-.550E-06	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.560E-05	in/in/F
HEAT CONDUCTIVITY (11)	KF11	0.403E+03	BTU-IN/HR/IN**2/F
HEAT CONDUCTIVITY (22)	KF22	0.403E+02	BTU-IN/HR/IN**2/F
Heat capacity	Cf	0.170E+00	BTU/lb/F
Fiber tensile strength	SfT	0.350E+06	psi
Fiber compressive strength	SfC	0.300E+06	psi

MOD2 GRAPHITE FIBER - INTERMEDIATE MODULUS.

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Number of fibers per end	Nf	10000	number
Filament equivalent diameter	df	0.300E-03	inches
Weight density	Rhof	0.630E-01	lb/in**3

Normal moduli (11)	Ef11	0.380E+08	psi
Normal moduli (22)	Ef22	0.110E+07	psi
Poisson's ratio (12)	Nuf12	0.200E+00	non-dim
Poisson's ratio (23)	Nuf23	0.250E+00	non-dim
Shear moduli (12)	Gf12	0.150E+07	psi
Shear moduli (23)	Gf23	0.800E+06	psi
Thermal expansion coef. (11)	Alfaf11	-.550E-06	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.560E-05	in/in/F
HEAT CONDUCTIVITY (11)	KF11	0.403E+01	BTU-IN/HR/IN**2/F
HEAT CONDUCTIVITY (22)	KF22	0.403E+00	BTU-IN/HR/IN**2/F
Heat capacity	Cf	0.170E+00	BTU/lb/F
Fiber tensile strength	SfT	0.350E+06	psi
Fiber compressive strength	SfC	0.250E+06	psi

MOD1 GRAPHITE FIBER - HIGH MODULUS.

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Number of fibers per end	Nf	10000	number
Filament equivalent diameter	df	0.300E-03	inches
Weight density	Rhof	0.720E-01	lb/in**3
Normal moduli (11)	Ef11	0.600E+08	psi
Normal moduli (22)	Ef22	0.900E+06	psi
Poisson's ratio (12)	Nuf12	0.200E+00	non-dim
Poisson's ratio (23)	Nuf23	0.250E+00	non-dim
Shear moduli (12)	Gf12	0.110E+07	psi
Shear moduli (23)	Gf23	0.700E+06	psi
Thermal expansion coef. (11)	Alfaf11	-.550E-06	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.560E-05	in/in/F
HEAT CONDUCTIVITY (11)	KF11	0.403E+01	BTU-IN/HR/IN**2/F
HEAT CONDUCTIVITY (22)	KF22	0.403E+00	BTU-IN/HR/IN**2/F
Heat capacity	Cf	0.170E+00	BTU/lb/F
Fiber tensile strength	SfT	0.250E+06	psi
Fiber compressive strength	SfC	0.200E+06	psi

AS-- GRAPHITE FIBER.

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Number of fibers per end	Nf	10000	number
Filament equivalent diameter	df	0.300E-03	inches
Weight density	Rhof	0.630E-01	lb/in**3
Normal moduli (11)	Ef11	0.310E+08	psi
Normal moduli (22)	Ef22	0.200E+07	psi
Poisson's ratio (12)	Nuf12	0.200E+00	non-dim
Poisson's ratio (23)	Nuf23	0.250E+00	non-dim
Shear moduli (12)	Gf12	0.200E+07	psi
Shear moduli (23)	Gf23	0.100E+07	psi
Thermal expansion coef. (11)	Alfaf11	-.550E-06	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.560E-05	in/in/F
HEAT CONDUCTIVITY (11)	KF11	0.403E+01	BTU-IN/HR/IN**2/F
HEAT CONDUCTIVITY (22)	KF22	0.403E+00	BTU-IN/HR/IN**2/F
Heat capacity	Cf	0.170E+00	BTU/lb/F
Fiber tensile strength	SfT	0.400E+06	psi
Fiber compressive strength	SfC	0.400E+06	psi

SGLA S- GLASS FIBER.

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Number of fibers per end	Nf	204	number
Filament equivalent diameter	df	0.360E-03	inches
Weight density	Rhof	0.900E-01	lb/in**3

Normal moduli (11)	Ef11	0.124E+08	psi
Normal moduli (22)	Ef22	0.124E+08	psi
Poisson's ratio (12)	Nuf12	0.200E+00	non-dim
Poisson's ratio (23)	Nuf23	0.200E+00	non-dim
Shear moduli (12)	Gf12	0.517E+07	psi
Shear moduli (23)	Gf23	0.517E+07	psi
Thermal expansion coef. (11)	Alfaf11	0.280E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.280E-05	in/in/F
HEAT CONDUCTIVITY (11)	Kf11	0.625E+00	BTU-IN/HR/IN**2/F
HEAT CONDUCTIVITY (22)	Kf22	0.625E+00	BTU-IN/HR/IN**2/F
Heat capacity	Cf	0.170E+00	BTU/lb/F
Fiber tensile strength	SfT	0.360E+06	psi
Fiber compressive strength	SfC	0.300E+06	psi

KEVL KEVLAR FIBER.

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Number of fibers per end	Nf	580	number
Filament equivalent diameter	df	0.460E-03	inches
Weight density	Rhof	0.530E-01	lb/in**3
Normal moduli (11)	Ef11	0.220E+08	psi
Normal moduli (22)	Ef22	0.600E+06	psi
Poisson's ratio (12)	Nuf12	0.350E+00	non-dim
Poisson's ratio (23)	Nuf23	0.350E+00	non-dim
Shear moduli (12)	Gf12	0.420E+06	psi
Shear moduli (23)	Gf23	0.220E+06	psi
Thermal expansion coef. (11)	Alfaf11	-.220E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.300E-04	in/in/F
Heat conductivity (11)	Kf11	0.170E+01	BTU-in/hr/in**2/F
Heat conductivity (22)	Kf22	0.170E+01	BTU-in/hr/in**2/F
Heat capacity	Cf	0.250E+00	BTU/lb/F
Fiber tensile strength	SfT	0.400E+06	psi
Fiber compressive strength	SfC	0.750E+05	psi

BOR5 BORON FIBER - 5 MIL DIAMETER.

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Number of fibers per end	Nf	1	number
Filament equivalent diameter	df	0.560E-02	inches
Weight density	Rhof	0.950E-01	lb/in**3
Normal moduli (11)	Ef11	0.580E+08	psi
Normal moduli (22)	Ef22	0.580E+08	psi
Poisson's ratio (12)	Nuf12	0.200E+00	non-dim
Poisson's ratio (23)	Nuf23	0.200E+00	non-dim
Shear moduli (12)	Gf12	0.242E+08	psi
Shear moduli (23)	Gf23	0.242E+08	psi
Thermal expansion coef. (11)	Alfaf11	0.280E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.280E-05	in/in/F
Heat conductivity (11)	Kf11	0.155E+01	BTU-in/hr/in**2/F
Heat conductivity (22)	Kf22	0.155E+01	BTU-in/hr/in**2/F
Heat capacity	Cf	0.310E+00	BTU/lb/F
Fiber tensile strength	SfT	0.600E+06	psi
Fiber compressive strength	SfC	0.700E+06	psi

EGLA E-GLASS FIBER.

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Number of fibers per end	Nf	204	number
Filament equivalent diameter	df	0.360E-03	inches
Weight density	Rhof	0.900E-01	lb/in**3
Normal moduli (11)	Ef11	0.105E+08	psi

Normal moduli (22)	Ef22	0.105E+08	psi
Poisson's ratio (12)	Nuf12	0.200E+00	non-dim
Poisson's ratio (23)	Nuf23	0.200E+00	non-dim
Shear moduli (12)	Gf12	0.437E+07	psi
Shear moduli (23)	Gf23	0.437E+07	psi
Thermal expansion coef. (11)	Alfaf11	0.280E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.280E-05	in/in/F
HEAT CONDUCTIVITY (11)	Kf11	0.625E+00	BTU-IN/HR/IN**2/F
HEAT CONDUCTIVITY (22)	Kf22	0.625E+00	BTU-IN/HR/IN**2/F
Heat capacity	Cf	0.170E+00	BTU/lb/F
Fiber tensile strength	SfT	0.360E+06	psi
Fiber compressive strength	SfC	0.360E+06	psi

SW4M STAINLESS STEEL WIRE.

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Number of fibers per end	Nf	1	number
Filament equivalent diameter	df	0.400E-02	inches
Weight density	Rhof	0.278E+00	lb/in**3
Normal moduli (11)	Ef11	0.290E+08	psi
Normal moduli (22)	Ef22	0.290E+08	psi
Poisson's ratio (12)	Nuf12	0.300E+00	non-dim
Poisson's ratio (23)	Nuf23	0.300E+00	non-dim
Shear moduli (12)	Gf12	0.112E+08	psi
Shear moduli (23)	Gf23	0.112E+08	psi
Thermal expansion coef. (11)	Alfaf11	0.560E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.560E-05	in/in/F
Heat conductivity (11)	Kf11	0.108E+03	BTU-in/hr/in**2/F
Heat conductivity (22)	Kf22	0.108E+03	BTU-in/hr/in**2/F
Heat capacity	Cf	0.120E+00	BTU/lb/F
Fiber tensile strength	SfT	0.160E+06	psi
Fiber compressive strength	SfC	0.160E+06	psi

TITF TITANIUM FIBER.

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Number of fibers per end	Nf	1	number
Filament equivalent diameter	df	0.430E-02	inches
Weight density	Rhof	0.161E+00	lb/in**3
Normal moduli (11)	Ef11	0.166E+08	psi
Normal moduli (22)	Ef22	0.166E+08	psi
Poisson's ratio (12)	Nuf12	0.305E+00	non-dim
Poisson's ratio (23)	Nuf23	0.305E+00	non-dim
Shear moduli (12)	Gf12	0.636E+07	psi
Shear moduli (23)	Gf23	0.636E+07	psi
Thermal expansion coef. (11)	Alfaf11	0.571E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.571E-05	in/in/F
Heat conductivity (11)	Kf11	0.100E+01	BTU-in/hr/in**2/F
Heat conductivity (22)	Kf22	0.100E+01	BTU-in/hr/in**2/F
Heat capacity	Cf	0.127E+00	BTU/lb/F
Fiber tensile strength	SfT	0.120E+06	psi
Fiber compressive strength	SfC	0.120E+06	psi

TUNG TUNGSTEN FIBER (W-1.5%THO2).

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Number of fibers per end	Nf	1	number
Filament equivalent diameter	df	0.600E-02	inches
Weight density	Rhof	0.697E+00	lb/in**3
Normal moduli (11)	Ef11	0.521E+08	psi
Normal moduli (22)	Ef22	0.521E+08	psi

Poisson's ratio (12)	Nuf12	0.290E+00	non-dim
Poisson's ratio (23)	Nuf23	0.290E+00	non-dim
Shear moduli (12)	Gf12	0.202E+08	psi
Shear moduli (23)	Gf23	0.202E+08	psi
Thermal expansion coef. (11)	Alfaf11	0.244E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.244E-05	in/in/F
Heat conductivity (11)	Kf11	0.828E+01	BTU-in/hr/in**2/F
Heat conductivity (22)	Kf22	0.828E+01	BTU-in/hr/in**2/F
Heat capacity	Cf	0.316E-01	BTU/lb/F
Fiber tensile strength	SfT	0.355E+06	psi
Fiber compressive strength	SfC	0.355E+06	psi

SICA SICA FIBER (W-1.5%THO2).

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Number of fibers per end	Nf	1	number
Filament equivalent diameter	df	0.600E-02	inches
Weight density	Rhof	0.697E+00	lb/in**3
Normal moduli (11)	Ef11	0.580E+08	psi
Normal moduli (22)	Ef22	0.580E+08	psi
Poisson's ratio (12)	Nuf12	0.250E+00	non-dim
Poisson's ratio (23)	Nuf23	0.250E+00	non-dim
Shear moduli (12)	Gf12	0.232E+08	psi
Shear moduli (23)	Gf23	0.232E+08	psi
Thermal expansion coef. (11)	Alfaf11	0.270E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.270E-05	in/in/F
Heat conductivity (11)	Kf11	0.828E+01	BTU-in/hr/in**2/F
Heat conductivity (22)	Kf22	0.828E+01	BTU-in/hr/in**2/F
Heat capacity	Cf	0.316E-01	BTU/lb/F
Fiber tensile strength	SfT	0.355E+06	psi
Fiber compressive strength	SfC	0.355E+06	psi

SICA SILICON CARBIDE ON ALUMINUM. SEPT 7,1987. (6)

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Number of fibers per end	Nf	1	number
Filament equivalent diameter	df	0.560E-02	inches
Weight density	Rhof	0.110E+00	lb/in**3
Normal moduli (11)	Ef11	0.620E+08	psi
Normal moduli (22)	Ef22	0.620E+08	psi
Poisson's ratio (12)	Nuf12	0.300E+00	non-dim
Poisson's ratio (23)	Nuf23	0.300E+00	non-dim
Shear moduli (12)	Gf12	0.238E+08	psi
Shear moduli (23)	Gf23	0.238E+08	psi
Thermal expansion coef. (11)	Alfaf11	0.180E-05	in/in/F
Thermal expansion coef. (22)	Alfaf22	0.180E-05	in/in/F
Heat conductivity (11)	Kf11	0.750E+00	BTU-in/hr/in**2/F
Heat conductivity (22)	Kf22	0.750E+00	BTU-in/hr/in**2/F
Heat capacity	Cf	0.290E+00	BTU/lb/F
Fiber tensile strength	SfT	0.500E+06	psi
Fiber compressive strength	SfC	0.650E+06	psi

OVER END OF FIBER PROPERTIES

MATRIX PROPERTIES

BORM BORON MATRIX. AUG 22 1990 (3)

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Weight density	Rhom	0.950E-01	lb/in**3
Normal modulus	Em	0.580E+08	psi
Poisson's ratio	Num	0.200E+00	non-dim

Thermal expansion coef.	Alfa m	0.280E-05	in/in/F
Matrix heat conductivity	Km	0.155E+01	BTU-in/hr/in**2/F
Heat capacity	Cm	0.310E+00	BTU/lb/F
Matrix tensile strength	SmT	0.600E+06	psi
Matrix compressive strength	SmC	0.700E+06	psi
Matrix shear strength	SmS	0.100E+06	psi
Allowable tensile strain	eps mT	0.120E+00	in/in
Allowable compr. strain	eps mC	0.120E+00	in/in
Allowable shear strain	eps mS	0.120E+00	in/in
Allowable torsional strain	eps mTOR	0.120E+00	in/in
Void heat conductivity	kv	0.190E-01	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.180E+04	F

TI15 TITANIUM MATRIX. AUG 25, 1988. (3)

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Weight density	Rhom	0.172E+00	lb/in**3
Normal modulus	Em	0.123E+08	psi
Poisson's ratio	Num	0.320E+00	non-dim
Thermal expansion coef.	Alfa m	0.450E-05	in/in/F
Matrix heat conductivity	Km	0.390E+00	BTU-in/hr/in**2/F
Heat capacity	Cm	0.120E+00	BTU/lb/F
Matrix tensile strength	SmT	0.130E+06	psi
Matrix compressive strength	SmC	0.130E+06	psi
Matrix shear strength	SmS	0.910E+05	psi
Allowable tensile strain	eps mT	0.120E+00	in/in
Allowable compr. strain	eps mC	0.120E+00	in/in
Allowable shear strain	eps mS	0.120E+00	in/in
Allowable torsional strain	eps mTOR	0.120E+00	in/in
Void heat conductivity	kv	0.190E-01	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.180E+04	F

ADHX EQUIVALENT MATRIX PROPS. FOR ADHESIVE.

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Weight density	Rhom	0.400E-01	lb/in**3
Normal modulus	Em	0.300E+06	psi
Poisson's ratio	Num	0.450E+00	non-dim
Thermal expansion coef.	Alfa m	0.570E-04	in/in/F
Matrix heat conductivity	Km	0.125E+01	BTU-in/hr/in**2/F
Heat capacity	Cm	0.250E+00	BTU/lb/F
Matrix tensile strength	SmT	0.800E+04	psi
Matrix compressive strength	SmC	0.150E+05	psi
Matrix shear strength	SmS	0.800E+04	psi
Allowable tensile strain	eps mT	0.810E-01	in/in
Allowable compr. strain	eps mC	0.150E+00	in/in
Allowable shear strain	eps mS	0.100E+00	in/in
Allowable torsional strain	eps mTOR	0.100E+00	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.350E+03	F

ALT6 ALUMINUM MATRIX. DEC 16, 1987. (1)

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Weight density	Rhom	0.980E-01	lb/in**3
Normal modulus	Em	0.100E+08	psi
Poisson's ratio	Num	0.300E+00	non-dim
Thermal expansion coef.	Alfa m	0.131E-04	in/in/F
Matrix heat conductivity	Km	0.866E+01	BTU-in/hr/in**2/F
Heat capacity	Cm	0.230E+00	BTU/lb/F
Matrix tensile strength	SmT	0.180E+05	psi

Matrix compressive strength	SmC	0.180E+05	psi
Matrix shear strength	SmS	0.120E+05	psi
Allowable tensile strain	eps mT	0.300E+00	in/in
Allowable compr. strain	eps mC	0.300E+00	in/in
Allowable shear strain	eps mS	0.300E+00	in/in
Allowable torsional strain	eps mTOR	0.300E+00	in/in
Void heat conductivity	kv	0.190E-01	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.108E+04	F

SPOX IMHS INTERMEDIATE MODULUS HIGH STRENGTH MATRIX.

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Weight density	Rhom	0.443E-01	lb/in**3
Normal modulus	Em	0.500E+06	psi
Poisson's ratio	Num	0.410E+00	non-dim
Thermal expansion coef.	Alfa m	0.570E-04	in/in/F
MATRIX HEAT CONDUCTIVITY	KM	0.104E+00	BTU-IN/HR/IN**2/F
Heat capacity	Cm	0.250E+00	BTU/lb/F
Matrix tensile strength	SmT	0.150E+05	psi
Matrix compressive strength	SmC	0.300E+05	psi
Matrix shear strength	SmS	0.150E+05	psi
Allowable tensile strain	eps mT	0.140E-01	in/in
Allowable compr. strain	eps mC	0.420E-01	in/in
Allowable shear strain	eps mS	0.320E-01	in/in
Allowable torsional strain	eps mTOR	0.380E-01	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.420E+03	F

EPOX IMHS INTERMEDIATE MODULUS HIGH STRENGTH MATRIX.

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Weight density	Rhom	0.443E-01	lb/in**3
Normal modulus	Em	0.500E+06	psi
Poisson's ratio	Num	0.350E+00	non-dim
Thermal expansion coef.	Alfa m	0.428E-04	in/in/F
MATRIX HEAT CONDUCTIVITY	KM	0.104E+00	BTU-IN/HR/IN**2/F
Heat capacity	Cm	0.250E+00	BTU/lb/F
Matrix tensile strength	SmT	0.150E+05	psi
Matrix compressive strength	SmC	0.350E+05	psi
Matrix shear strength	SmS	0.130E+05	psi
Allowable tensile strain	eps mT	0.200E-01	in/in
Allowable compr. strain	eps mC	0.500E-01	in/in
Allowable shear strain	eps mS	0.450E-01	in/in
Allowable torsional strain	eps mTOR	0.450E-01	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.420E+03	F

ERLA HMHS HIGH MODULUS HIGH STRENGTH MATRIX.

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Weight density	Rhom	0.450E-01	lb/in**3
Normal modulus	Em	0.750E+06	psi
Poisson's ratio	Num	0.350E+00	non-dim
Thermal expansion coef.	Alfa m	0.400E-04	in/in/F
Matrix heat conductivity	Km	0.104E+00	BTU-in/hr/in**2/F
Heat capacity	Cm	0.250E+00	BTU/lb/F
Matrix tensile strength	SmT	0.200E+05	psi
Matrix compressive strength	SmC	0.500E+05	psi
Matrix shear strength	SmS	0.150E+05	psi
Allowable tensile strain	eps mT	0.200E-01	in/in
Allowable compr. strain	eps mC	0.500E-01	in/in

Allowable shear strain	eps mS	0.400E-01	in/in
Allowable torsional strain	eps mTOR	0.400E-01	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.420E+03	F

POLY POLYIMIDE MATRIX.

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Weight density	Rhom	0.440E-01	lb/in**3
Normal modulus	Em	0.500E+06	psi
Poisson's ratio	Num	0.350E+00	non-dim
Thermal expansion coef.	Alfa m	0.200E-04	in/in/F
Matrix heat conductivity	Km	0.146E+00	BTU-in/hr/in**2/F
Heat capacity	Cm	0.250E+00	BTU/lb/F
Matrix tensile strength	SmT	0.150E+05	psi
Matrix compressive strength	SmC	0.300E+05	psi
Matrix shear strength	SmS	0.130E+05	psi
Allowable tensile strain	eps mT	0.200E-01	in/in
Allowable compr. strain	eps mC	0.400E-01	in/in
Allowable shear strain	eps mS	0.350E-01	in/in
Allowable torsional strain	eps mTOR	0.350E-01	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.700E+03	F

ALTX ALUMINUM MATRIX.

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Weight density	Rhom	0.950E-01	lb/in**3
Normal modulus	Em	0.100E+08	psi
Poisson's ratio	Num	0.330E+00	non-dim
Thermal expansion coef.	Alfa m	0.129E-04	in/in/F
Matrix heat conductivity	Km	0.866E+01	BTU-in/hr/in**2/F
Heat capacity	Cm	0.230E+00	BTU/lb/F
Matrix tensile strength	SmT	0.520E+05	psi
Matrix compressive strength	SmC	0.520E+05	psi
Matrix shear strength	SmS	0.260E+05	psi
Allowable tensile strain	eps mT	0.520E-02	in/in
Allowable compr. strain	eps mC	0.520E-02	in/in
Allowable shear strain	eps mS	0.905E-02	in/in
Allowable torsional strain	eps mTOR	0.905E-02	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.108E+04	F

TIT6 TITANIUM MATRIX.

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Weight density	Rhom	0.161E+00	lb/in**3
Normal modulus	Em	0.165E+08	psi
Poisson's ratio	Num	0.300E+00	non-dim
Thermal expansion coef.	Alfa m	0.570E-05	in/in/F
Matrix heat conductivity	Km	0.100E+01	BTU-in/hr/in**2/F
Heat capacity	Cm	0.127E+00	BTU/lb/F
Matrix tensile strength	SmT	0.120E+06	psi
Matrix compressive strength	SmC	0.120E+06	psi
Matrix shear strength	SmS	0.800E+05	psi
Allowable tensile strain	eps mT	0.730E-02	in/in
Allowable compr. strain	eps mC	0.730E-02	in/in
Allowable shear strain	eps mS	0.124E-01	in/in
Allowable torsional strain	eps mTOR	0.124E-01	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.150E+04	F

EPOC EPOXY MATRIX.

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Weight density      Rhom      0.440E-01      lb/in**3
Normal modulus      Em        0.500E+06      psi
Poisson"s ratio     Num        0.350E+00      non-dim
Thermal expansion coef. Alfa m  0.360E-04      in/in/F
Matrix heat conductivity Km      0.146E+00      BTU-in/hr/in**2/F
Heat capacity       Cm        0.250E+00      BTU/lb/F
Matrix tensile strength SmT     0.150E+05      psi
Matrix compressive strength SmC    0.250E+05      psi
Matrix shear strength SmS     0.130E+05      psi
Allowable tensile strain eps mT   0.200E-02      in/in
Allowable compr. strain eps mC    0.500E-02      in/in
Allowable shear strain eps mS    0.350E-02      in/in
Allowable torsional strain eps mTOR 0.350E-02      in/in
Void heat conductivity kv        0.225E+00      BTU-in/hr/in**2/F
Glass transition temperature Tgdr   0.410E+03      F

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SSAL STAINLESS STEEL MATRIX.

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Weight density      Rhom      0.281E+00      lb/in**3
Normal modulus      Em        0.289E+08      psi
Poisson"s ratio     Num        0.300E+00      non-dim
Thermal expansion coef. Alfa m  0.570E-05      in/in/F
Matrix heat conductivity Km      0.158E+01      BTU-in/hr/in**2/F
Heat capacity       Cm        0.120E+00      BTU/lb/F
Matrix tensile strength SmT     0.160E+06      psi
Matrix compressive strength SmC    0.160E+06      psi
Matrix shear strength SmS     0.120E+06      psi
Allowable tensile strain eps mT   0.550E-02      in/in
Allowable compr. strain eps mC    0.550E-02      in/in
Allowable shear strain eps mS    0.104E-01      in/in
Allowable torsional strain eps mTOR 0.104E-01      in/in
Void heat conductivity kv        0.225E+00      BTU-in/hr/in**2/F
Glass transition temperature Tgdr   0.266E+04      F

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BERY BERYLLIUM MATRIX.

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Weight density      Rhom      0.570E-01      lb/in**3
Normal modulus      Em        0.440E+08      psi
Poisson"s ratio     Num        0.100E+00      non-dim
Thermal expansion coef. Alfa m  0.640E-05      in/in/F
Matrix heat conductivity Km      0.968E+01      BTU-in/hr/in**2/F
Heat capacity       Cm        0.450E+00      BTU/lb/F
Matrix tensile strength SmT     0.133E+06      psi
Matrix compressive strength SmC    0.133E+06      psi
Matrix shear strength SmS     0.770E+05      psi
Allowable tensile strain eps mT   0.302E-02      in/in
Allowable compr. strain eps mC    0.302E-02      in/in
Allowable shear strain eps mS    0.385E-02      in/in
Allowable torsional strain eps mTOR 0.385E-02      in/in
Void heat conductivity kv        0.225E+00      BTU-in/hr/in**2/F
Glass transition temperature Tgdr   0.234E+04      F

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LMLS LOW MODULUS LOW STRENGTH MATRIX.

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Weight density	Rhom	0.420E-01	lb/in**3
Normal modulus	Em	0.320E+06	psi
Poisson's ratio	Num	0.430E+00	non-dim
Thermal expansion coef.	Alfa m	0.570E-04	in/in/F
Matrix heat conductivity	Km	0.104E+00	BTU-in/hr/in**2/F
Heat capacity	Cm	0.250E+00	BTU/lb/F
Matrix tensile strength	SmT	0.800E+04	psi
Matrix compressive strength	SmC	0.150E+05	psi
Matrix shear strength	SmS	0.800E+04	psi
Allowable tensile strain	eps mT	0.810E-01	in/in
Allowable compr. strain	eps mC	0.150E+00	in/in
Allowable shear strain	eps mS	0.100E+00	in/in
Allowable torsional strain	eps mTOR	0.100E+00	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.350E+03	F

IMLS INTERMEDIATE MODULUS LOW STRENGTH MATRIX.

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Weight density	Rhom	0.460E-01	lb/in**3
Normal modulus	Em	0.500E+06	psi
Poisson's ratio	Num	0.410E+00	non-dim
Thermal expansion coef.	Alfa m	0.570E-04	in/in/F
Matrix heat conductivity	Km	0.104E+00	BTU-in/hr/in**2/F
Heat capacity	Cm	0.250E+00	BTU/lb/F
Matrix tensile strength	SmT	0.700E+04	psi
Matrix compressive strength	SmC	0.210E+05	psi
Matrix shear strength	SmS	0.700E+04	psi
Allowable tensile strain	eps mT	0.140E-01	in/in
Allowable compr. strain	eps mC	0.420E-01	in/in
Allowable shear strain	eps mS	0.320E-01	in/in
Allowable torsional strain	eps mTOR	0.320E-01	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.420E+03	F

FECR SUPERALLOY (FE-25%CR-4%AL-1%Y) MATRIX

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Weight density	Rhom	0.260E+00	lb/in**3
Normal modulus	Em	0.302E+08	psi
Poisson's ratio	Num	0.300E+00	non-dim
Thermal expansion coef.	Alfa m	0.528E-05	in/in/F
Matrix heat conductivity	Km	0.125E+01	BTU-in/hr/in**2/F
Heat capacity	Cm	0.112E+00	BTU/lb/F
Matrix tensile strength	SmT	0.110E+06	psi
Matrix compressive strength	SmC	0.110E+06	psi
Matrix shear strength	SmS	0.660E+05	psi
Allowable tensile strain	eps mT	0.256E-02	in/in
Allowable compr. strain	eps mC	0.256E-02	in/in
Allowable shear strain	eps mS	0.154E-02	in/in
Allowable torsional strain	eps mTOR	0.154E-02	in/in
Void heat conductivity	kv	0.225E+00	BTU-in/hr/in**2/F
Glass transition temperature	Tgdr	0.105E+04	F

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13. ABSTRACT (Maximum 200 words) The Technology Benefit Estimator (T/BEST) system is a formal method to assess advanced technologies and quantify the benefit contributions for prioritization. T/BEST may be used to provide guidelines to identify and prioritize high payoff research areas, help manage research and limited resources, show the link between advanced concepts and the bottom line, i.e., accrued benefit and value, and to credibly communicate the benefits of research. The T/BEST software computer program is specifically designed for estimating benefits, and benefit sensitivities, of introducing new technologies into existing propulsion systems. Key engine cycle, structural, fluid, mission and cost analysis modules are used to provide a framework for interfacing with advanced technologies. An open-ended, modular approach is used to allow for modification and addition of both key and advanced technology modules. T/BEST has a hierarchical framework that yields varying levels of benefit estimation accuracy that are dependent on the degree of input detail available. This hierarchical feature permits rapid estimation of technology benefits even when the technology is at the conceptual stage. As knowledge of the technology details increases the accuracy of the benefit analysis increases. Included in T/BEST's framework are correlations developed from a statistical data base that is relied upon if there is insufficient information given in a particular area, e.g., fuel capacity or aircraft landing weight. Statistical predictions are not required if these data are specified in the mission requirements. The engine cycle, structural, fluid, cost, noise, and emissions analyses interact with the default or user material and component libraries to yield estimates of specific global benefits: range, speed, thrust, capacity, component life, noise, emissions, specific fuel consumption, component and engine weights, pre-certification test, mission performance engine cost, direct operating cost, life cycle cost, manufacturing cost, development cost, risk, and development time. Currently, T/BEST operates on stand-alone or networked workstations, and uses a UNIX shell or script to control the operation of interfaced FORTRAN based analyses. T/BEST's interface structure works equally well with non-FORTRAN or mixed software analyses. This interface structure is designed to maintain the integrity of the expert's analyses by interfacing with expert's existing input and output files. Parameter input and output data (e.g., number of blades, hub diameters, etc.) are passed via T/BEST's neutral file, while copious data (e.g., finite element models, profiles, etc.) are passed via file pointers that point to the experts' analyses output files. In order to make the communications between the T/BEST's neutral file and attached analyses codes simple, only two software commands, PUT and GET, are required. This simplicity permits easy access to all input and output variables contained within the neutral file. Both public domain and proprietary analyses codes may be attached with a minimal amount of effort, while maintaining full data and analysis integrity, and security. T/BEST's software framework, status, beginner-to-expert operation, interface architecture, analysis module addition, key analysis modules are discussed. Representative examples of T/BEST benefit analyses are shown.				
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